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### STUDIES IN THE LAURACEAE, IV PRELIMINARY STUDY OF THE PAPUASIAN SPECIES COLLECTED BY THE ARCHBOLD EXPEDITIONS

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*Concluded from page 131*

#### **Cryptocarya** R. Br.

A word should be inserted at this point about the genus *Cryptocarya*. There are a few affinities of the Papuan species to be found in other islands of the Pacific, in Malaya, etc., but no near relatives. The majority of previously described species from New Guinea were described from flowering material only. It is possible to match the description of only one of these species with the New Guinean material at hand. Only by an examination of the types of Tschner can one be certain of the proper disposition of the material belonging in *Cryptocarya*. Much sterile material has been put aside until such time as it may be compared with the types. Many species have been set apart on fruiting or flowering material only. Oftentimes the fruit of this family is diseased, which fact has further hindered work in this genus. Care has been taken to limit new species only to those which have an outstanding feature or features which could not fail to have come to the attention of previous workers and hence have appeared in their descriptions.

#### **Cryptocarya tetragona**, spec. nov.

Arbor, ramulis crassis glabris lenticellatis striatis griseo-rubrescentibus, junioribus adpresse castaneo-pubescentibus, alte sulcatis tetragonis. Folia alternata, elliptica vel lanceolato-elliptica, ad 8–10.5 cm. longa, 2.5–4 cm. lata, coriacea, caudata, cauda  $\pm$  1 cm. longa, basi cuneata, supra glabra, subtus glauca, juniora minute adpresse aureo-brunnescentia triplinervia, nervis majoribus 3–5 mm. supra basim laminae divergentibus supra inconspicuis subtus elevatis, lateralibus 1–2 laminae supra medium, petiolis rubescentibus ad 13 mm. longis, glabris, junioribus griseo-pubescentibus. Inflorescentia axillaris, terminalis, racemoso-paniculata, crassa, brevis, ad 3 cm. longa (post anthesin), adpresse castaneo-pubescentis. Flores 2 mm. longi, extus pubescentes,  $\pm$  sessiles. Fructus ater, asymmetricus, depressus,

irregulariter costatus, corollae reliquiis coronatus, 0.9 cm. longus, 1.2 cm. latus.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, *Clemens* 5447 (TYPE, AA), alt. 1830 m., Feb. 19, 1937.

The species is very close to *C. cinnamomifolia* F. v. Muell. from Australia, the Australian species having shorter and broader leaves, more tapering toward the longer acumen with the broader portion below the middle, usually glabrous, less castaneous, and with more brownish pubescence when present, the laterals diverging up to 12 mm. from the base, larger flowers (3 mm.) and larger fruit ( $\pm$  12 mm.), subglobose, glaucous, and with the rough surface faintly costate. The branchlets are less coarsely striate, with lenticels not apparent, pale brown in color and glabrous.

***Cryptocarya argyrophylla*, spec. nov.**

Arbor, ramulis gracilis glabris teretibus striatis ad nodos leviter complanatis atro-brunnescentibus. Folia alterna, ovata vel ovato-elliptica, 5–8 cm. longa, 3.5–(4.5) lata, coriacea, anguste caudata, basi rotundata vel acuta, supra glabra, nitida, subtus glabrescentia, juniora supra leviter subtus dense argenteo-lepidoto-pubescentia, triplinervia, nervis prope basim laminae varie divergentibus, supra impressis, subtus elevatis, lateralibus 1–2, petiolis ad 1 cm. longis atro-brunnescentibus glabris vel glabrescentibus. Inflorescentia axillaris vel terminalis, laxe paniculata, ad 8 cm. longa, breviter brunneo-pubescentia. Flores  $\pm$  2 mm. longi, perianthii lobis punctatis. Fructus viridis fide coll., in sicco ater, inaequilateraliter ellipsoideus, apice basique abrupte angustatus, glaber, leviter costatus, 2.5 cm. longus, 1.2 cm. latus, saepe guttatus et papillosus.

NORTHEASTERN NEW GUINEA: Morobe District, Ogeramnang, *Clemens* 4739 (TYPE, AA), alt. 1830 m., Dec. 23, 1936; Yunzaing, *Clemens* 3566 (AA), alt. 1370 m., July 15, 1936 (forest tree 1.25 m., fruit green).

The smallish, shining, oval, triplinerved leaves, the blackish branchlets, and the widespreading brownish inflorescence make this species stand out from the rest of this group. Possibly *Clemens* 3566 does not belong with it, but, allowing for difference in stage of collection, it seems a fair match. The fruit seems to be unequal due to disease.

***Cryptocarya camptodroma*, spec. nov.**

Arbor parva, virgata, 3–4 m. alta, ramulis maculosis teretibus minute striatis glabrescentibus mox glabris lucidis, flavescenti-brunneis, junioribus fulvo-tomentosis. Folia alternata, oblongo-lanceolata, 10–14 cm. longa, 2.2–3.8 cm. lata, subcoriacea, longe abrupte caudato-acuminata, basi obtusa vel cuneata, supra glabra nitida, juniora glabrescentia, subtus molliter sparse tomentosa, triplinervia, nervis supra basim laminae varie ad 5 mm. divergentibus, lateralibus supra medium 1–2, supra camptodromis impressis subtus elevatis, petiolis ad 1 cm. longis fulvo-tomentosis mox fusco-tomentosis. Inflorescentia ignota. Infructescentia axillaris, brevis, 1–2(?) cm. longa, tomentosa vel glabrescens? Fructus purpureo-ater fide coll., subglobosus vel ellipsoideus, glaber, costatus, late apiculatus, ad 2.2 cm. longus, 1.9 cm. latus, vel 3 cm. longus, 1.7 cm. latus.

BRITISH NEW GUINEA: Central Division, Dieni, Ononge Road, *Brass* 3802 (TYPE, NY), alt. 500 m., common, in dry type of rain-forest on ridge crests, April 20, 1933



(virgate small tree 3-4 m.; the leaves shining above, underneath yellow-green; nerves impressed; ripe fruit purple-black).

Although represented only by a fruiting specimen, placing it unquestionably in the genus *Cryptocarya*, this species is so very distinct and unlike any other known species as to warrant description. The long-caudate subcoriaceous leaves, yellow-green beneath, frequently constricted slightly below the tip, the tawny-tomentose young branchlets and underleaf surface and impressed nerves, and the camptodrome venation apparent above the middle of the leaf combine to make the species outstanding.

***Cryptocarya scalariformis*, spec. nov.**

Arbor parva ad 10 m. alta, ramulis glabris junioribus glabrescentibus minute striatis, junioribus leviter complanatis, pallide flavo-brunnescentibus. Folia alternata vel subopposita, oblonga, 12-18 cm. longa, 5.5-6 cm. lata, pergamentacea, caudato-acuminata, cauda ad 1 cm. longa, basi abrupte cuneata, utrinque glabra, triplinervia, nervis prope basim laminae divergentibus supra inconspicuis subtus elevatis petiolis rubescentibus ad 1.5 cm. longis glabris supra canaliculatis. Inflorescentia axillaris, racemosa(?), gracilis, summo pauciflora, ad 4.5 cm. longa, glabrescens. Flores magni,  $\pm$  6 mm. longi, gilvo-flavescentes, glabri, pedicellis ad 2 mm. longis. Fructus ignotus, ex descriptione 4 cm. longus, 3.4 cm. latus, melo-coloratus.

SOLOMON ISLANDS: Bougainville: Marmaromino, *Kajewski* 2204 (TYPE, AA), alt. 50 m., common in rain-forest, Sept. 30, 1930 (small tree up to 10 m. high; petals cream-yellow, base of buds brown; fruit apple-colored, only one on specimens, length 4 cm., diam. 3.4 cm.; the leaves are the subject of a native superstition that if pieces of the leaves are blown after a ceremony, they cause blindness, usually by an enemy of the person afflicted; common name: "Oo-pu").

The nearest relative is *Cryptocarya pauciflora* Lauterb. & K. Schum. (*Pseudocryptocarya pauciflora* [L. & S.] Teschner, in Engl. Bot. Jahrb. 58: 412. 1923) from Northeastern New Guinea. The latter, however, is a shrub 1-1.5 m. high, with leaves never more than 12 cm. long and a caudate tip of 2 cm. long, whereas *C. scalariformis* is a small tree up to 10 m. high, with leaves never less than 15 cm. long and caudate tip not more than 1 cm. long. The flowers also present differences on detailed examination. Another fairly close affinity is found in *C. cinnamomifolia* Merr. from the Philippines. The wider, somewhat heavier leaves with less evident parallel cross venation immediately separate the two. From Teschner's description and notes on his new genus, I see no reason for maintaining it as separate from *Cryptocarya*. Examination of the type, particularly of the fruit, may show further characters which will warrant a distinct genus.

***Cryptocarya exfoliata*, spec. nov.**

Arbor ad 15 m. alta, trunco alte ramulis leviter sulcatis, leviter et pallide fulvo-pubescentibus, junioribus dense fulvo-pubescentibus. Folia elliptica, 5-12 cm. longa, 2-5.5 cm. lata, chartacea, obtuse caudata vel breviter obtuse acuminata, basi cuneata, interdum obtusa, supra nitida, glabra, juniora pilosa, subtus pilosa, glauca fide coll., plerumque subtripplinervia, nervis lateralibus 3(-6), supra gracillimis, basi leviter elevatis apice evanidis subtus leviter elevatioribus, minute inconspicueque areolata, petio-

lis 6-8(-12) mm. longis, gracilibus supra sulcatis pubescentibus. Inflorescentia ignota. Infructescentia axillaris vel terminalis, ad 7 cm. longa racemoso-paniculata, leviter sulcata vel striata dense adpresse pubescens, ramulis aliquid geniculatis. Fructus ater, ellipsoideus vel subglobosus, glaber, minute papillosus, nitidus, apiculatus,  $\pm 1$  cm. longus, 0.8 cm. latus.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7655 (TYPE, AA), dry type rain-forest fringing lake, Sept. 1936 (tree 15 m. high; bark thin, grey, exfoliating in flaky scales; stem deeply flanged, the flanges extending to the branches and even the branchlets corrugate; underside of leaves glaucous; fruit smooth, black,  $\pm 1$  cm. diam.); Lower Fly River, east bank opposite Sturt Island, *Brass* 8175 (AA), rain-forest of inland dry ridges, Oct. 1936 (low canopy tree 10-12 m.; leaves glaucous underneath; fruit smooth, black).

The species is one of the few from New Guinea which falls into the triplinerviate group, although some individual leaves are penninerved. The leaves are of an unusual dark grey-green color on drying, which, with their glaucous lower surface, causes them to be distinguished immediately. The small shining ellipsoid to subglobose fruit, coupled with the somewhat geniculate closely appressed pubescent floral branchlets, also represent an unusual feature. The flanged trunk and branchlets occur in other species, but not in the triplinerved group. The Lower Fly River specimen bears leaves which are obscurely triplinerved. Close examination, however, shows leaves on the same branchlet exhibiting that condition.

***Cryptocarya idenburgensis*, spec. nov.**

Arbor ad 29 m. alta, ramulis glabrescentibus teretibus striatis, atrobrunnescentibus, junioribus angulatis, griseis sparse pubescentibus. Folia alternata, lanceolato-elliptica vel elliptica, 8-15 cm. longa, 2.7-5 cm. lata, percoriacea, attenuate acuminata, basi subrotundata, saepe inaequalia, supra sparse minute glabrescentia, subtus minute dense adpresse griseo-pubescentia, ut videtur glauca, triplinervia, nervis prope basim laminae varie divergentibus, lateralibus 2 supra medium, supra impressis subtus elevatis, petiolis crassis ad 2 cm. longis sparse minute griseo-pubescentibus canaliculatis. Inflorescentia immatura, axillaris vel terminalis, ad 6 cm. longa, densiflora, patenti-paniculata, dense adpresse sericeo-ferrugineo-pubescentia. Flores magni  $\pm 4$  mm. longi, extus pubescentes, perianthii tubo intus pubescente. Fructus ignotus.

NETHERLANDS NEW GUINEA: 15 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh* 11912 (TYPE, AA), alt. 1740 m., occasional on the slopes in rain-forest, Jan. 11, 1939 (tree 29 m. high, diameter 47 cm.; crown not widespreading; bark 8 mm. thick, brown, fairly smooth; wood brown; flowers brown, not yet open).

A striking species because of the very coriaceous triplinerviate leaves, which are glaucous beneath, and the bright ferrugineous-pubescent dense-flowered inflorescence. The nearest species is *C. tetragona*, which is represented by a specimen in a later stage of development. In the latter there is apparently, as far as can be judged from the post-anthesis inflorescence, the same ferrugineous pubescence. Generally speaking, the leaves of the latter are of the same type, but differ in size, shape, pubescence and the length of petiole, those of *C. idenburgensis* being up to 15 cm. long, usually lanceolate-elliptic with long attenuate-acuminate tips, densely appressed greyish pubescent beneath, and petioles up to 2 cm. long. Possibly inter-



mediate specimens may eventually be collected that will make it expedient to include the two in a single species.

***Cryptocarya globosa*, spec. nov.**

Arbor ad 20 m. alta, ramulis breviter ferrugineo-tomentosis mox glabris teretibus. Folia alternata, oblonga, 17–26 cm. longa, 7–8 cm. lata, chartacea, breviter apiculata vel leviter apiculato-acuminata, basi acuta inaequalia, utrinque costa glabrescente excepta glabra, in sicco subtus rubescente, minute glanduloso-punctata, penninervia, nervis 10–12 supra impressis subtus elevatis, costa subtus pallide brunnea fide coll., reticulata, petiolis aliquid crassis, ad 1.5 cm. longis, breviter adpresse ferrugineo-tomentosis mox glabris. Inflorescentia ignota. Infructescencia axillaris, aliquando ramosa crassa, brevis ad 6 cm. longa, utrinque glabra. Fructus ater, glaber, laevis, in sicco leviter brunneo-guttatus, saepe rimosus, globosus, saepe basi abrupte attenuatus (subturbinatus), obtuse apiculatus, 3.4 × 3 cm. fide coll., ± sessilis.

SOLOMON ISLANDS: Bougainville: Kugumaru, Buin, *Kajewski* 1784 (TYPE, AA), alt. 150 m., common in rain-forest, May 28, 1930 (medium-sized tree up to 20 m. high; midrib light brown beneath; fruit black when ripe, in length 3.4 cm., in diameter 3 cm., with small protuberance at end; common name: "Tin-diinni").

Another species so distinctive that, although only fruiting material is available, a description is inevitable. The typical fruit places it without question in *Cryptocarya*, despite the presence of thin chartaceous leaves unusual for the genus. From the description of *C. depressa* Warb., one might be inclined to claim relationship here for the new species. Warburg 20574 from the Bismarck Archipelago, presumably the type of the former, is at variance with Warburg's description. The leaves are less than 15 × 5–6 cm., and are pubescent below, whereas Warburg notes leaves 18–22 × 7–10 cm. and glabrous. Warburg states in his description that underneath the tree he found flowers of a *Cylicodaphne* but was not sure that they belonged to his specimen. The fruit of no. 20574 is obviously of a *Cryptocarya*. K. Schumann & Lauterbach (Fl. Deutsch. Schutzgeb. Südsee 333. 1901) remark, in connection with *C. depressa*, that many specimens of bark and leaves of *Massoia* come in, (an aromatic lauraceous plant which is probably a species of *Cinnamomum* and which Schewe l.c. has placed under *Cinnamomum*), but no flowers or fruit. Apparently the authors feel that there is perhaps some connection here with Warburg's species. *Cryptocarya globosa* is in all probability aromatic also, if one may judge by the presence of countless minute punctate glands that are visible on the leaves under a lens. It is impossible to clear up the situation without access to the specimen from which Warburg drew his inadequate diagnosis. Meanwhile *C. globosa* is mentioned as a possible relative.

***Cryptocarya Brassii*, spec. nov.**

Arbor 12–14 m. alta, cortice brunneo in squamis parvis mollibus exfoliato, fide coll., ramulis minute pubescentibus mox glabrescentibus, griseo-brunnescentibus. Folia alternata, oblonga, ad 26 cm. longa, ad 10 cm. lata, coriacea, apice basique breviter obtuse acuminata, supra glabra, nitida, subtus sparse pilosa, penninervia, nervis ± 17, supra impressis subtus elevatis

minute pubescentibus, costa supra impressa subtus crassa elevata minute pubescente mox glabrescente, crasse conspicueque reticulata, petiolis crassis ad 2 cm. longis, 3 mm. latis rugosis glabrescentibus. Inflorescentia ignota. Infructescentia terminalis, late-paniculata, crassa, ad 15 cm. longa lataque, ramulis utrinque pubescentibus subangulatis. Fructus ater, apice basique pallide minute pubescens, paullo turbinatus, apiculatus, obscure costatus, ad 1.5 cm. longus, ad 8 mm. latus,  $\pm$  sessiles.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7516 (TYPE, AA), common in rain-forest substage, Aug. 1936 (tree 12–14 m. high; bark close, brown, exfoliating in small soft scales; fruit black); possibly also *Brass* 7499 (AA), same locality, common tree in rain-forest canopy layer, Aug. 1936 (leaves stiff, the underside brown pubescent; fruit black  $\pm$  1 cm. long); Koitaki, *Carr* 12693 (NY), alt. 450 m., forest, June 25, 1935 (tree 15 m. tall; buds brown); same locality, *Carr* 12740 (NY), June 27, 1935 (leaves brown hairy beneath; young fruit green).

It is probable that the Carr specimens in flower and young fruit may represent early stages of *C. Brassii*. The two Brass collections cited I feel strongly to be the same, but they are in different stages of development and growing under slightly different conditions. More complete material will aid in solving the difficulty.

***Cryptocarya cordata*, spec. nov.**

Arbor magna, ramulis dense pallide ferrugineo-tomentosis obscure striatis. Folia subopposita oblonga, 8.5–31 cm. longa, 2.5–10 cm. lata, subcoriacea, longe mucronata, basi cordata, supra costa pubescente excepta glabra, nitida fide coll., subtus molliter pubescentia, penninervia, nervis 10–20, supra impressis subtus elevatis pallide ferrugineo-tomentosis ad marginem divergentibus, costa supra pubescente subtus elevata pallide ferrugineo-tomentosa, venis transversis parallelis, minute reticulata, petiolis crassis ad 0.5 cm. longis dense pallide ferrugineo-tomentosis. Inflorescentia ignota. Infructescentia axillaris, paniculata, crassa, ad 8 cm. longa, utrinque breviter pallide ferrugineo-tomentosa. Fructus ater, glaber, paullo turbinatus, obtuse apiculatus, ut videtur costatus, ad  $1.7 \times 0.9$  cm.,  $\pm$  sessiles.

NEW BRITAIN: Gazelle Peninsula, Nodup area, *Waterhouse* 324, *Yale Ser. No.* 28621, (TYPE, NY), Sept.–Oct. 1934 (large tree; leaf glossy, underside "soft"; fruit black, about size of currant, used as a relish with certain foods; Teop. name: "nubiri"; "Tukura").

SOLOMON ISLANDS: Bougainville: Marmaromino, *Kajewski* 2213 (AA), alt. 50 m., common in rain-forest, Sept. 30, 1930 (medium-sized tree up to 20 meters high, the young stems covered with short brown hair; leaves with prominent brown veins underneath; fruit black, in length 8 mm.; the leaves are heated and applied to sore eyes by natives; common name: "Tembu").

The species appears to be most closely related to the New Guinean species *C. multipaniculata* Teschner, from Kaiser-Wilhelmsland at an altitude of 600 m. The latter species, however, is noted as a small, myrmecophilous tree with acute or shortly acuminate leaves up to 19 cm. long, in which the lateral nerves are confluent near the margin. *Cryptocarya cordata* is a large tree with long-mucronate leaves up to 31 cm. long, in which the lateral nerves go to the very margin. The specimen cited from the Solomon Islands belongs here probably, although the majority of the leaves are broadly elliptic and much shorter than those of the type. At



most, the differences might be the means of designating a variety from that locality. Although there is only a single fruiting specimen represented, the tree is distinctive enough to warrant description.

***Cryptocarya umbonata*, spec. nov.**

Arbor parva ad 15 m. alta, ramulis gracilibus glabris striatis rubescentibus. Folia alternata, lanceolata, 8–13 cm. longa, 2–3.5 cm. lata, chartacea, attenuato-acuta vel acuminata, basi acuta, utrinque glabra, penninervia, nervis 6–9, supra quam subtus obscurioribus, utrinque reticulata, petiolis gracilibus 7–8 mm. longis, glabris rubescentibus. Inflorescentia ignota. Infructescentia axillaris(?), crassa, ad 3–4 cm. longa, glabra. Fructus ater, depresso-globosus, glaber, apice umbonatus, corollae reliquiis coronatus, 2.5 cm. longus, ad 3 cm. latus, pedicello incrassato glabro dense brunnescenti-lenticellato.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski 1695* (TYPE, AA), alt. 1000 m., common in rain-forest, April 12, 1930 (small tree up to 15 m. high; fruit length 2.5 cm., diameter 3 cm., much more broad than long, full grown on specimens, red when cut).

Few species of the genus have lanceolate, thin, papery leaves with fruit that is broader than long and borne on short branchlets. The umbonate tip of the fruit is an unusual feature as well. The flowers of the species should prove interesting to keep pace with the other characters. This is the first instance where the collector has mentioned that the inside flesh of the fruit is red when cut. The fact that the fruiting pedicel is enlarged is normal for the family but the superabundance of what appear to be numerous brownish lenticels completely obscuring the natural color of the branchlets might indicate disease of this part. There seems scarcely any doubt of the genus, certainly not of the family.

***Cryptocarya brevipes*, spec. nov.**

Arbor, ramulis tomentosis mox glabrescentibus, striatis. Folia elliptica vel ovata, raro inaequalia, ad 15 cm. longa, 6–7.5 cm. lata, coriacea, caudato-acuminata vel leviter acuminata, basi rotundata vel acuta, supra glabra subtus pilosa, minute glanduloso-punctata, penninervia, nervis 9–12 supra impressis leviter pubescentibus subtus elevatis dense ferrugineo-tomentosis, venulis sparsis, non reticulata, petiolis crassiusculis ad 1.1 cm. longis, tomentosis. Inflorescentia immatura, ferrugineo-tomentosa. Infructescentia axillaris, brevissima, crassa, ut videtur fructu singulo maturante, 0.7–2.5 cm. longa ferrugineo-tomentosa. Fructus rubescens subglobosus, glabrescens, mox glaber apice basique longe ferrugineo-pubescentibus, circiter 1.3 cm. diam., apice basique apiculatus, pedunculo  $\pm$  2 mm. longo crasso tomentoso.

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, *Clemens 3451* (TYPE, AA), alt. 1825 m., June 29, 1936; Ogeramang, *Clemens 5424* (AA), alt. 1830 m., forest hill, Feb. 17, 1937 (tall tree, dbh. 0.30–0.90 m., buds green).

The species is based on material so fragmentary that at first glance it seems useless to attempt a description. The unusually short infructescence, single-fruited at maturity, though showing that one or two other lateral fruits have fallen off earlier in the development of the fruiting branchlet, is an unusual character. The roundish fruit, fairly sharp-pointed at both

ends, with tufts of long rusty hairs, is also unique. Unfortunately, all except two leaves are cut off or broken at the tips, but the two remaining are very different and probably cover the range of variation that might be apparent in the others. No field notes accompany the specimens other than those given under the citation.

***Cryptocarya palmerensis*, spec. nov.**

Arbor procera gracilis, ramulis glabris striatis lenticellatis, atro-rubescens. Folia ovata vel elliptica, 7.5–12 cm. longa, 3–5.5 cm. lata, coriacea, obtusa vel obtuse acuminata, falcata, basi rotundata vel acuta, supra glabra, subtus glauca fide coll., penninervia, nervis 3–4 supra impressis subtus elevatis atro-rubescens leviter glabrescentibus, subconspicue reticulata, petiolis gracilibus ad 2 cm. longis glabris atro-rubescens, junioribus supra minute papillosis. Inflorescentia axillaris gracilis laxa paniculata, ad 5 cm. longa pallide adpresse ferrugineo-pubescentis, pauciflora, pedunculis ad 5 mm. longis. Flores ultimi 2–3, ad 2–3 mm. longi, extus intusque pubescentes, staminibus et staminodiis pubescentibus. Infructescentia axillaris, paniculata, ad 12 cm. longa, utrinque glabra, ramulis nitidis geniculatis. Fructus ater, glaucus, ellipsoideus, apice basique attenuatus, 2.5 cm. longus, 1.5 cm. latus, apice floris reliquiis coronatus, pedunculo breve.

BRITISH NEW GUINEA: Palmer River, 2 miles below junction of Black River, *Brass* 6868 (TYPE, fruit AA), alt. 100 m., riverine forest canopy, June 1936 (tall slender tree with spurred base, brown lenticellate bark, and brown wood; leaves glaucous below; immature fruit glaucous); 4 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh* 13127 (AA), alt. 850 m., frequent tree of primary rain-forest in the flat plain, March 9, 1939 (tree 29 m. high; diameter 54 cm.; crown not widespreading; bark 8 mm. thick, grey; wood orange-red; fruit green).

Under *Cryptocarya palmerensis* may be placed the following: Eil. Bak. Soroëi, Netherlands Indies Forest Service *bb* 30925 (fl., AA), alt. 50 m., Sept. 28, 1939; 30915, 30918.

The localities of the two *Brass* specimens cited are separated by high mountain ranges and the altitudes differ by 750 meters. With so many points in common, however, it must become evident that there is close affinity between them. It remains to be seen whether or not an abundance of material will reveal a series of intergrading specimens, localities and altitudes which will justify two entities being considered as belonging to the same species.

***Cryptocarya sulcata*, spec. nov.**

Arbor, ramulis glabris sulcatis dense lenticellatis, griseis vel rubescentibus. Folia oblonda, 9.5–16 cm. longa, 5–8 cm. lata, coriacea, apice basique rotundata, vel retusa basi abrupte acuminata, margine revoluta, leviter undulata, utrinque glabra nitida? penninervia, nervis 9–12, supra impressis, subtus elevatis, costa leviter papillosa, pallide rubescente, venulis transversis supra inconspicuis subparallelis, subtus reticulata, petiolis crassis ad 2 cm. longis ad 4 mm. diam., nigrescentibus glabris, adultioribus lenticellatis. Inflorescentia axillaris et terminalis paniculata, ad 12 cm. longa, multiflora, minute dense puberula, pedunculis ad 4 cm. longis glabrescentibus sulcatis minute papillosis, ramulis striatis ad nodos leviter complanatis. Flores circiter 3 mm. longi, extus pubescentes, brevipedicellati. Fructus



(no. 1769) immaturus?, viridis fide coll., in sicco atro-rubescens, ellipsoideus, glaber, leviter maculatus, apice floris reliquiis coronatus, basi attenuatus.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, *Clemens* 3450 (TYPE, AA), alt. 1525 m., June 29, 1936; Ogeramnang, *Clemens* 4827 (AA), alt. 1795 m., Jan. 1, 1937; Yunzaing, *Clemens* 3435 (AA), alt. 1525 m., June 26, 1936; Wareo, *Clemens* 1769 (AA), alt. 750 m., high forest, Feb. 4, 1936 (tree dbh. 26 cm.; leaves pale below; flower dull yellow; fruit 1-seeded, green).

Many species from New Guinea have more or less sulcate branchlets, but those of these species are sulcate to a greater degree than most. This, with the numerous prominent lenticels, indicates a new species. There can be no doubt that the first three numbers are conspecific. The fruit, apparently, is diseased, although it is possible to note that it is ellipsoid, and maculose in the manner of *C. Mackinnonian* F. v. Muell. or *C. Whiteana* Allen. Vegetatively it has some points of resemblance with *C. Brassii* Allen. The presence of numerous lenticels shows a similarity to *C. verrucosa* Teschner but it lacks the acuminate leaves, lanuginose below, among other differences. *Clemens* 1769 is in a younger stage, but there is present the same sulcate and lenticellate condition of the branchlets. The leaves are perhaps less coriaceous, with a more definite apex and thirteen pairs of lateral nerves. The inflorescence is shorter but similar to the more developed inflorescences of the other numbers. The fruit is borne on much thickened pedicels, striate and verrucose, the fruiting branchlets are sulcate, becoming striate toward the tips. The apex of the fruit has a prominent crown about 2 mm. across, consisting of the remains of the flower.

***Cryptocarya pergamentacea*, spec. nov.**

Arbor 15 m. alta, ramulis gracilibus glabris nitidis striatis ad nodos leviter complanatis rubescentibus. Folia alternata, lanceolata vel lanceolato-elliptica, 9–12.5 cm. longa, 2.5–6 cm. lata, pergamentacea, longe caudato-acuminata, saepe falcata, cauda 1–1.8 cm. longa, basi acuta vel leviter attenuata, utrinque glabra, in sicco subtus pallida, penninervia, nervis pubescentibus pallidis, fide coll., 5–6 in axillis superioribus domatiis parvis insignitis in sicco supra obscuris subtus elevatis rubescentibus, subtus quam supra conspicuius minute reticulata, petiolis gracilibus, ad 1.5 cm. longis glabris rubescentibus. Inflorescentia terminalis et axillaris, laxa paniculata, gracilis ad 12 cm. longa, multiflora, glabra, summa glabrescente, pedunculis longis. Flores  $\pm$  2.3 mm. longi, gilvi fide coll., perianthii lobis extus pubescentibus, brevipedicellatis vel sessilibus. Fructus ignotus.

BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 8012 (TYPE, AA), substage tree in flood plain rain-forest, Oct. 1936 (tree 15 m. high; leaf nerves pale; flowers cream-coloured).

The species is unique because of the parchment-like, often falcate, drip-tip leaves. The presence of domatia or glands in the axils of the lower pairs of lateral nerves on the lower surface of the leaves is unusual for the genus. The glands are not visible from the upper surface of the dried specimens but show up below due to the small tuft of hairs sprouting from the axils. *Cryptocarya foveolata* White & Francis from Australia has glands, but in this species the leaves are three-nerved and the glands are very prominent

above and below, as in the widespread *Cinnamomum Camphora* (L.) Nees & Eberm. from the Orient. The long, graceful, rather spreading, many-flowered inflorescence is also a distinguishing feature of *C. pergamentacea*.

***Cryptocarya subfalcata*, spec. nov.**

Arbor parva, ramulis gracilibus glabris striatis teretibus griseis, junioribus rubescentibus. Folia elliptica vel lanceolato-elliptica, 6–12 cm., raro 13 cm. longa, 2–3.5 cm., raro 4.5 cm. lata, chartacea, apice caudata, cauda  $\pm$  1 cm. longa, subfalcata basi obtusa, utrinque glabra, penninervia, nervis 4–5 supra obscuris subtus elevatis, costa supra impressa subtus elevata, utrinque reticulata, petiolis gracilibus 5–7 cm. longis glabris canaliculatis. Inflorescentia axillaris, paniculata, gracilis, ad 3 cm. longa, glabrescens. Flores parvi, 1.6 mm. longi, ochracei fide coll., extus glabrescentes pedicellis brevibus pubescentibus. Fructus immaturus(?).

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, *Clemens* 3907 (TYPE, AA), alt. 1370 m., forest hills, Aug. 18, 1936 (small tree, dbh. 7.5–10 cm.; flower khaki-yellow); *Clemens* 3772 (AA), alt. 1370 m., forest trail, Aug. 6, 1936 (tree height variable, dbh. 10 cm. to big tree; fruit green to very dark).

The slender, greyish, terete branchlets, the small glabrous leaves, and the slender short inflorescence with small flowers mark this species as differing from all others. The fruit of the type specimen is small (5 mm. diam.) and subglobular. It is probably in very young stage, and appears to have been attacked by insects or in some way diseased. *Number* 3772 shows obconic fruit, 8 mm. long, 10 mm. wide. The structure, as well as the texture of these fruits, appears abnormal even in the dried state. Although the leaves are slightly longer on the whole than those of the type specimen, they are probably conspecific.

***Cryptocarya aureobrunnea*, spec. nov.**

Arbor parva, ramulis glabrescentibus plus minusve glandulosis, junioribus pubescentibus, teretibus, striatis brunnescentibus. Folia elliptica, 6.5–14 cm. longa, 4.5–7.5 cm. lata, subcoriacea, rotundata vel leviter obtuse acuminata, basi subrotundata vel obtusa, supra glabra, subtus glabrescentia deinde glabra, penninervia, nervis 5–7 supra inconspicuis subtus elevatis, costa supra impressa plus minusve papillosa, subtus elevata, subtus graciliter reticulata, petiolis 1–1.2 cm. longis, glabrescentibus, papillosis brunnescentibus. Inflorescentia axillaris, pluripaniculata, plerumque ramosa, ad 15 cm. longa, adpresse aureo-brunneo-subsericeo-pubescentis, ramulis papillosis, angulatis. Flores minute ferrugineo-pubescentes, ad 2.5 mm. longi. Fructus ignotus.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass* 14072 (TYPE, AA), alt. 50 m., flooded rain-forest of river plains, April 1939 (tree 15 m. high).

The numerous, slender, many-panicked, golden brown axillary inflorescences, almost silky appressed pubescent with minute flowers, is sufficient grounds for denoting this species as new. The glandular condition prominent on the branchlets of the inflorescence and less so on the stems proper is another mark of distinction. Near this, or perhaps even belonging to it, are the following *Clemens* numbers, the branchlets of which apparently have been attacked by a fungus: NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, *Clemens* 1824 (AA), alt. 990 m., hill forest, Feb. 13, 1936 (small



tree, dbh. 10–15 cm.; leaves pale beneath; flower buds golden brown); same locality, *Clemens 1887* (AA), Feb. 19, 1936.

***Cryptocarya Whiteana*, spec. nov.**

Arbor 15 m. alta, ramulis griseo-fuscis glabrescentibus, junioribus dense ferrugineo-tomentosis. Folia alternata, oblonga vel elliptica, juniora subrotundata, 3–10 cm. longa, 2–4.5 cm. lata, per coriacea, subbullata, rotundata vel retusa, basi obtusa rotundata vel subauriculata, margine saepe revoluta, supra costa nervisque exceptis glabra, junioribus utrinque pubescentibus, nitida, subtus subglauca, pubescentia, penninervia, nervis 5–9 utrinque ferrugineo- vel pallide ferrugineo-tomentosis supra impressis subtus elevatis venis transversis parallelis utrinque conspicuis, supra inconspicue minuteque areolata, petiolis crassis ad 1 cm. longis dense ferrugineo-tomentosis mox fusco-glabrescentibus. Inflorescentia ignota. Infructescentia axillaris, paniculata, crassa, ad 10 cm. longa, fusco-glabrescens. Fructus purpurascens, in sicco albo-guttatus, glaber, late ellipticus, late apiculatus, scaber,  $2 \times 1.5$  cm.,  $\pm$  sessilis.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, *Brass 5003* (TYPE, NY), alt. 2400 m., common in damp valley forests, Sept. 11, 1933 (tree 15 m. or more high, with dense irregular crown of very stiff concave leaves and an abundance of hard purplish fruit; flowers not seen).

In determining this number in 1936, Mr. C. T. White, Government Botanist of Queensland, made the following note: "This is very like *C. Mackinnoniana* of North Queensland, but the Papuan species has a much broader fruit and is probably another, but closely allied, species." His comment on the fruit is correct and other differences in pubescence and leaf characters are evident as well. It is a pleasure to name it in honor of Mr. White, who has done much to further our knowledge of Australasian and Papuanian flora.

***Cryptocarya Archboldiana*, spec. nov.**

Arbor 25 m. alta, ramulis glabris sulcato-angulatis ad nodos leviter complanatis atro-rubrescentibus. Folia alternata, ovata vel ovato-elliptica, 6.5–11 cm. longa, 3–5.5 cm. lata, coriacea, breviter caudato-acuminata basi rotundata, obtusa vel raro acuta, supra glabra, subtus minute sparse breviter pubescentia, penninervia, nervis 3, raro 4, supra inconspicuis subtus elevatis, petiolis gracilioribus, 1–1.5 cm. longis, glabrescentibus atro-rubrescentibus, plus minusve papillosis. Inflorescentia terminalis et axillaris, erecte paniculata, ad 8 cm. longa, pubescens, infima glabra, pedunculis ad 3 cm. longis, plus minusve papillosis. Flores ad 3.3 mm. longi, flavi fide coll., perianthii lobis extus intusque pubescentibus brevipedicellatis. Fructus viridis, fide coll., glaber, ellipsoideus, obscure costatus vel rugosus, obscure papillosus.

NETHERLANDS NEW GUINEA: 4 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh 14110* (TYPE, AA), alt. 75 m., on lower mountain slopes of primary rain-forest, May 3, 1939 (tree 25 m. high, diameter 43 cm.; crown not widespreading; bark 10 mm. thick, brown; wood brown; flowers yellow); same locality, *Brass & Versteegh 13119*, (AA), alt. 850 m., occasional tree of primary rain-forest in the flat plain, March 7, 1939 (tree 25 m. high, diameter 46 cm.; crown not widespreading; bark 6 mm. thick, black; wood brown; fruits green).

The last-mentioned specimen is from a branch in a younger stage of de-

velopment, bearing mature fruits, which apparently are left from the crop of the previous season. The lower leaves are more coriaceous, while the new growth, continuing through last year's inflorescence, shows young leaves in the process of unfolding. Despite the difference in age of the two branchlets, it is apparent that the specimens are conspecific. One of the most distinct features is the sturdy terminal inflorescence with papillose surface and angled or even sulcate branchlets. The sericeous, silvery or golden, appressed pubescence on the lower surface of the young leaves has rarely been noted in the genus.

***Cryptocarya bernhardiensis*, spec. nov.**

Arbor 10–12 m. alta, ramulis gracilibus glabris, junioribus pubescentibus, griseis. Folia elliptica, raro elliptico-ovata, 6–8.5–10 cm. longa, 2–4 cm. lata, chartacea, caudata, cauda  $\pm$  1 cm. longa, basi subrotundata vel obtusa, matura supra glabra, juniora pilosa, subtus glauca, longe pubescentia, penninervia, nervis 4–6, supra obscuris impressis plus minusve pubescentibus subtus elevatis pallide brunnescentibus, subtus reticulata, petiolis gracilibus ad 8 mm. longis minute denseque pubescentibus. Inflorescentia ignota. Infructescentia axillaris, gracilis, ad 4 cm. longa, pubescens. Fructus ater, subglobosus, ut videtur bipartitus, glaber, minute papillosus, apice corollae cicatrice coronatus, 1 cm. longus, 1.5 cm. latus.

NETHERLANDS NEW GUINEA: 6 km. sw. of Bernhard Camp, Idenburg River, *Brass 12968* (TYPE, AA), alt. 1200 m., rain-forest substage tree, Feb. 1939 (tree 10 m. high; underside of leaves glaucous; fruit black); 4 km. sw. of Bernhard Camp, Idenburg River, *Brass 13467* (AA), alt. 850 m., rain-forest of river plains, March 1939 (slender substage tree 12 m. high).

The species is unusual for its fruit, which is wider than long, obscurely channeled along its longitudinal circumference, giving the appearance of a bipartite condition. This type of fruit is found in *Cryptocarya corrugata* White & Francis from Queensland, but resemblance to that species ends there.

***Cryptocarya Kajewskii*, spec. nov.**

Arbor ad 25 m. alta, ramulis glabris, junioribus minute pubescentibus, striatis lenticellatis, atro-rubrescentibus. Folia alternata, ovata vel ovato-elliptica, saepe obliqua, 6–9 cm. longa, 2–4.5 cm. lata, subcoriacea, acuta vel attenuate acuta, minute mucronulata, basi rotundata vel abrupte acuminata, saepe inaequalia, raro acuta, supra glabra, nitida, in sicco rubro-brunnescentia, subtus minute sparse pilosa, argentea, fide coll., penninervia, nervis 3–4 (–5) supra impressis inconspicuis subtus elevatis, utrinque reticulata, petiolis gracilibus, ad 1 cm. longis minute pubescentibus. Inflorescentia immatura, terminalis et axillaris, paniculata, ad 4 cm. longa, minute adpresse pubescens. Flores  $\pm$  2 mm. longi, perianthii lobis crassis, extus pubescentibus. Fructus ignotus.

SOLOMON ISLANDS: Bougainville: Kupei Gold Field, *Kajewski 1676* (TYPE, AA), alt. 950 m., common in rain-forest, April 10, 1930 (medium- to large-sized tree up to 25 m. high; leaves silvery beneath, the young leaves pink-green; flowers buds only on specimen).

This is a very striking species because of the dark reddish brown ovate leaves. It resembles no known Papuanian species, but certainly belongs to



*Cryptocarya*. There is no suggestion of a silvery or glaucous under-leaf surface on the dried specimen. On the branchlets of the immature inflorescences an approach to a papillate condition is noticeable.

***Cryptocarya Ledermannii*** Teschner in Engl. Bot. Jahrb. **58**: 408. 1932.

NETHERLANDS NEW GUINEA: 18 km. sw. of Bernhard Camp, Idenburg River, *Brass* 12677 (AA), alt. 2150 m., frequent in substage layer of mossy forest, Feb. 1939 (tree attaining 10 m.; underside of leaves glaucous; flowers green; fruit unripe); same locality, *Brass & Versteegh* 12530 (AA), alt. 1230 m., occasional tree on slope of ridge of primary forest, Feb. 17, 1939 (tree 28 m. high, diameter 53 cm.; crown not wide-spreading; bark 12 mm. thick, black, fairly rough; wood brown; fruits red-brown).

*Brass* 12677 shows young leaves densely woolly ferrugineous-tomentose on both surfaces. The rusty color of the pubescence apparently becomes dark fuscous as the season advances, for older leaves and branchlets have no trace of brightness. Indeed, the tomentum itself wears off as the branchlets lengthen. The young inflorescence is also densely woolly ferrugineous-tomentose and the flowers are noted as green, as opposed to the yellow of Teschner's description. On this specimen is a single fruit which *Brass* indicates as unripe. Number 12530 is an older branchlet, with longer internodes and slightly larger leaves, and is less tomentose throughout. No glaucous condition of the leaves is noted, but that, if present on younger leaves, may be evanescent with age. The few fruits left on the branchlets are apparently immature, even though the collectors have stated that they are red-brown.

***Cryptocarya perlucida***, spec. nov.

Arbor. ramulis rigidis glabris, junioribus rigide atro-pubescentibus, atro-rubrescentibus. Folia elliptica vel elliptico-ovata, ad 7 cm. longa, 2-3 cm. lata, coriacea, caudato-acuminata, cauda  $\pm$  1 cm. longa, basi acuta leviter subaequalia, utrinque glabra, in sicco castanea, supra lucida, penninervia, nervis 4-5 supra impressis subtus elevatis, subtus obscure reticulata, petiolis ad 1 cm. longis atro-rubrescentibus, glabris vel glabrescentibus. Inflorescentia axillaris et subterminalis, paniculata, ad 5 cm. longa, fulvo-pubescentis. Flores 2-3 mm. longi, ochracei, fide coll., extus pubescentes  $\pm$  sessiles. Fructus immaturus (?).

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, *Clemens* 4076 (TYPE, AA), alt. 1525 m., forest hill, Sept. 3, 1936 (tree 0.3-5.5 m. diam.; flower dull khaki; fruit dark olive); Yoangen-Yunzaing, *Clemens* 3351 (AA), alt. 1220-1525 m., June 18, 1936; Ogeramnang, *Clemens* 5397 (AA), alt. 1830 m., Feb. 15, 1937.

Numbers 3351 and 5397 have leaves slightly larger (9 cm. long) than those of the type, and somewhat glaucous below. The branchlets of 5397 seem slightly less coarse and lack the remnants of the spreading black pubescence found on the type; also the leaves appear to be less shining. The fruit of the type is either immature or diseased. The combination of castaneous glabrous caudate leaves, fulvous inflorescence, and stiff reddish black branchlets set this species apart from the others. It seems to be most closely related to *C. Schlechteri* Teschner from Kaiser-Wilhelmsland, but may be distinguished by narrower caudate acuminate leaves, and minutely pubescent panicles.

***Cryptocarya minutifolia*, spec. nov.**

Arbor 14–16 m. alta, ramulis glabris, junioribus minute verrucosis, fusco-brunneis. Folia alternata, late elliptica vel subrotundata, ad 2 cm. longa, 1.4 cm. lata, coriacea, rigida, rotundata, saepe retusa, basi acuta vel attenuate acuta, utrinque glabra, supra nitida, subtus glauca, fide coll., margine revoluta, penninervia, nervis 3–4 supra inconspicuis subtus elevatis costa supra impressa subtus elevata, supra levis subtus minute reticulata, petioli ad 4 mm. longis gracilibus nigrescentibus glabris. Inflorescentia ignota. Infructescentia, ut videtur, terminalis, erecte paniculata, crassa, ad 6(–8) cm. longa, utrinque glabra, pedunculis nigrescentibus minute verrucosis. Fructus ater, glaber, nitidus, subglobosus vel subturbinatus, apiculatus, rugosus et subcostatus fide coll., ad 1.4 cm. diam.  $\pm$  sessilis.

BRITISH NEW GUINEA: Central Division, Murray Pass, Wharton Range, *Brass* 4741 (TYPE, NY), alt. 2840 m., one of the principal species in range top forests, Aug. 7, 1933 (large clear-trunked wide-crowned tree 14–16 m. tall; leaves stiff; upperside shining; lower glaucous; margins recurved; fruit shining black, wrinkled and somewhat costate, 1.2–1.4 cm. diam.).

Although only a single specimen is available, and that in fruit, there can be no doubt of its status as a new species. Nowhere in the genus are found such small leaves. The costate fruit crowned with the remains of the floral parts place it unquestionably in *Cryptocarya*. The length of the inflorescence and its position are difficult to determine in the fruiting specimen because many times the leaves fall as the infructescence develops, making the panicle appear terminal.

**Endiandra R. Br.**

***Endiandra grandifolia*** Teschner in Engl. Bot Jahrb. **58**: 417. 1923.

NORTHEASTERN NEW GUINEA: Morobe District, Quembung Mission, *Clemens* 2110 (AA), alt. 600 m., margin forest mission house, March 23, 1936 (tree 19.5–21 m. flower brown; fruit green); Wareo, *Clemens* 1600 (AA), alt. 600 m., Jan. 8, 1936.

The leaves of the above numbers are obtuse or very shortly acuminate at the apex, less obtuse than acutish at the base, and the anthers are introrse. Otherwise the specimens are a match for the description of Teschner's *E. grandifolia*.

***Endiandra Brassii*, spec. nov.**

Arbor ad 27 m. alta, ramulis glabris striatis atro-rubrescentibus. Folia alternata, elliptica vel oblongo-elliptica, 13–21 cm. longa, 6–10 cm. lata, glabra, subcoriacea, obtusa vel breviter obtuse acuminata, basi acuta vel leviter attenuata, saepe leviter inaequale, supra nitida, penninervia, nervis 8–10 supra subinconspicuis, subtus leviter elevatis, costa atro-rubescens supra leviter impressa subtus elevata, utrinque conspicue reticulata, petioli crassis canaliculatis ad 2.2 cm. longis atro-rubrescentibus glabris. Inflorescentia subterminalis, longe paniculata, ad 16 cm. longa, glabrescens, multiflora, pedunculis ad 4.5 cm. longis crassiusculus. Flores  $\pm$  2 mm. longi, flavo-viridescens, pubescentes mox glabrescentes, pedicellis  $\pm$  1 mm. longis glabrescentibus. Fructus fusco-viridescens, glaber inaequilateraliter obovoideus, basi attenuatus, stipitatus, in toto ad 8 cm. longus, (stipe  $\pm$  2 cm. longo) 4 cm. diam., in sicco obscure angulatus.



NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass & Versteegh 14101* (TYPE, AA), alt. 70 m., frequent tree of secondary forest in the flood plain, April 30, 1939 (tree 19 m. high, diameter 38 cm.; crown not widespreading; bark 8 mm. thick, grey-brown, fissured; wood red-brown; flowers light green; fruits green); same locality, *Brass & Versteegh 13589* (AA), alt. 350 m., occasional tree on a ridge of primary rain-forest, April 19, 1939 (tree 27 m. high, diameter 49 cm.; crown not widespreading; bark 15 mm. thick, grey, scaly, fissured wood red-brown; sterile). BRITISH NEW GUINEA: Palmer River, 2 miles below junction of Black River, *Brass 6921* (AA), alt. 100 m., in riverine forest, June 1936 (small substage tree 8 m. high; leaf nerves brown; small brown flowers in erect solitary panicles); Koitaki, *Carr 12683* (NY), alt. 450 m., forest, June 25, 1935 (tree 36 m. tall; flowers green).

The leaves of this species are very like those of *E. rubescens* (Bl.) Bl. and *E. macrophylla* (Bl.) Boerl. from Malaya, but the inflorescence is longer, more branched and spreading, and the flowers are very small. *Brass 6921* is placed here although the leaves have more pronounced venation and the leaf base is more cuneate than obtuse. Also, the branchlets appear greyish rather than reddish brown. The Carr number is rather doubtfully placed here, but is probably the same. The leaves have a tendency to be smaller, less spreading and the flowers perhaps larger.

In connection with *E. Brassii* the following should be considered: NORTHEASTERN NEW GUINEA: Morobe District, Wareo, *Clemens 1421* (AA), alt. 600 m., Jan. 1936. This is more robust throughout than *E. Brassii*. The leaves are more coriaceous, the petioles thicker, the inflorescence stouter and more pubescent, and the flowers larger, although not approaching the proportions of those of *E. rubescens*. The general coarseness of the branchlets, the leaves, and their reticulation recall *E. praeclara*, also from Malaya. The flowers of the former are, however, smaller and the number of veins less than occur in the latter.

***Endiandra Clemensii*, spec. nov.**

Arbor? ramis griseis rimosis cicatricosis, ramulis brunnescentibus papillo-sis. Folia opposita vel alternata, late lanceolata, 15–18 cm. longa, 4.5–7 cm. lata, glabra, coriacea, leviter obtuse acuminata, basi acuta attenuata, margine undulata, supra nitida, subtus glauca, penninervia, nervis supra planis subtus elevatis pallide flavis, costa subtus papillosa, utrinque conspicue crassequae reticulata, petiolis crassis ad 1.5 cm. longis brunnescentibus glabrescentibus. Inflorescentia axillaris, laxae paniculata, ad 17 cm. longa, pauciflora, pedunculis ad 0.5 cm. longis. Flores  $\pm$  2 mm. longi, glabrescentes, pedicellis ad 2 mm. longis pubescentibus, perianthii lobis punctatis. Fructus ignotus.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, *Clemens 1742* (TYPE, AA), alt. 900 m., Jan. 29, 1936; *Clemens 1848* (AA), alt. 1050 m., Feb. 15, 1936 (tree dbh. 0.30 m.; flower yellow-green).

Ordinarily one would hesitate to describe a new species on such fragmentary material as is represented by this number, but the thickly coriaceous undulate leaves with light yellow venation and strong coarse reticulation set it apart. Also the sparsely flowered, loose, spreading panicles with flattened branchlets, covered with minute papillae, have their share in marking it as new. There is a suggestion of similarity in the general character of the leaves to those of *E. reticulata* Gillespie from Fiji, but the

resemblance ceases there, *E. reticulata* having smaller leaves and inflorescences.

It should be noted here that *Clemens 1848* consists of a sterile shoot with much larger leaves and branchlets that are striate, complanate at the nodes particularly, and with the same papillate condition obtaining on the young parts of the branchlets and the lower surface of the elevated costa of the leaves. An inflorescence, unattached but with the number, corresponds very well with that of the type, even to the oil dots on the corolla lobes.

***Endiandra glandulosa*, spec. nov.**

Arbor 15–22 m. alta, ramulis glabrescentibus mox glabris teretibus striatis rimosis lenticellatis, ultimis glanduloso-papillois atro-rubrescentibus. Folia subopposita vel alternata, elliptica vel lanceolato-elliptica, 5–8(–10) cm. longa, 2–4(–5.5) cm. lata, percoriacea, obtuse acuta vel abrupte obtuse acuminata vel obtusa, basi cuneata, margine revoluta, utrinque glabra, novellis fulvo-pilosis, subtus glauca, fide coll., utrinque supra conspicue subtus obscure glanduloso-papillosa, penninervia, nervis 6–10 utrinque inconspicuis, costa supra impressa, subtus elevata glanduloso-papillosa, petiolis ad 1.5 cm. longis fuscis glanduloso-papillois glabrescentibus mox glabris. Inflorescentia subterminalis, paniculata ad 7 cm. longa, fulvo-pubescent, utrinque glanduloso-papillosa, pedunculis ad 4 cm. longis. Flores 2–3, virides fide coll., 3 mm. longi, extus glabri, intus pubescentes, perianthii lobis glanduloso-punctatis subgibbosis, pedicellis 1.5 mm. longis pubescentibus, bractea lanceolata solitaria suffulta. Infructescentia ad 8 cm. longa, utrinque glabra, glanduloso-papillosa. Fructus rubro-brunnescent fide coll., glaber, glanduloso-papillosus, ellipsoideus, apice basique obtuse leviter angustatus,  $\pm 2.5 \times \pm 1.5$  cm., pedicello crasso glabro rubro-brunnescente  $\pm 5$  mm. longo.

NETHERLANDS NEW GUINEA: 4 km. sw. of Bernhard Camp, Idenburg River, *Brass 13678* (TYPE, AA), alt. 900 m., common in mossy-forest canopy layer, March 1939 (tree 15 m. high, 0.30 m. diameter; leaves glaucous underneath and the edges recurved; flowers green; fruit unripe); same locality, and alt., *Brass & Versteegh 13144* (AA), frequent tree on a ridge of mossy-forest, Mar. 12, 1939 (tree 22 m. high, diameter 46 cm.; crown not widespreading; bark 17 mm. thick, dark brown, scaly, rough, with a little gum; flowers white; fruits red-brown); 6 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh 12580* (AA), alt. 1200 m., occasional tree on a ridge of primary forest, Feb. 26, 1939 (tree 22 m. high, diameter 47 cm.; crown not widespreading; bark 13 mm. thick, brown, rough, shallowly fissured; wood light brown; fruits green); 15 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh 11968* (AA), alt. 1580 m., frequent tree on a ridge of primary forest, Jan. 23, 1939 (tree 26 m. high, diameter 46 cm.; crown not widespreading; bark 11 mm. thick, black, scaly; wood light brown; flowers white; young fruits green).

The striking feature of this *Endiandra* is the prevalence of glandulose papillae on the ultimate branchlets. The elliptic-lanceolate leaves, greenish brown on drying, also are completely covered with glandular protuberances. The young branchlet tips just past the bud stage are very closely appressed tawny-pubescent, this condition very soon passing. The nearest relatives of this species are found in New Caledonia. *Endiandra Baillonii* Guill. and *E. micrantha* Schlecht. belong in the group, but do not have the profusion of glandular prominences. The last cited specimen was included here only after much consideration. The glandular papillae on the ulti-



mate branchlets and leaves are not as obvious on this specimen, although present in almost as great a number. The leaves are smaller on the whole, not more than 7 cm. in length and 3.3 cm. in width. A large portion of the flowers examined have anthers opening by a single valve instead of the conventional two found in *Endiandra*. It was only by dissecting numerous flowers from the duplicate specimens that typical *Endiandra* stamens were found. Eventually both types were discovered in the same flower. Where the single valve occurs it is semi-lunar or dumbbell-shaped in outline. In other respects the freak flowers are similar to those of the type of *E. glandulosa*.

It is interesting to note that Hooker (Ic. Pl. **16**: t. 1515. 1886) in describing *Syndiclis paradoxa* states "A very remarkable genus, allied to *Endiandra*, the only one of the Order with a 1-celled ovary with a single valve, the emargination of which latter possibly indicates that it and the cell are formed by the confluence of two." *Syndiclis* is very probably an *Endiandra* with freak stamens. If Hooker had had more abundant material at his disposal it is possible that he might have discovered flowers of the normal *Endiandra* type, bearing two-valved anthers. As far as I have been able to ascertain, the type material is the only known material of the genus *Syndiclis*.

**Endiandra Ledermannii** Teschner in Engl. Bot. Jahrb. **58**: 415. 1923.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, Brass 7453 (AA), plentiful in rain-forest substage, Aug. 1936 (tree 15–16 m. high; leaves brownish underneath; fruit solitary, lateral or axillary, smooth, purple-brown).

The leaves of the above are on the whole less broad than those of Teschner's type, as he described it, but there can be no doubt that the Brass number is a fruiting specimen of *E. Ledermannii*.

**Endiandra Merrilliana**, spec. nov.

Arbor 12 m. alta, ramulis minute pallide ferrugineo-puberulis striatis. Folia alternata, lanceolata vel anguste elliptica, 4–6.5 cm. longa, 1.5–2.8 cm. lata, supra glabrescentia, subtus minute adpresse pubescentia paullo glauca, coriacea, obtuse vel leviter obtuse acuminata, saepe rotundata, basi cuneata saepe rhomboidea, penninervia, nervis 4–5, nervis et costa supra impressis dense pubescentibus, subtus elevatis pallide ferrugineo-pubescentibus, conspicue et regulariter minute elevato-areolata, petiolis gracilibus, ad 1 cm. longis minute pallide ferrugineo-puberulis. Inflorescentia axillaris, paniculata, ad 4.5 cm. longa, pauciflora, utrinque pallide ferrugineo-pubescentibus, pedunculis brevibus. Flores  $\pm$  2.5 mm. longi, virides, fide coll., 3 staminibus in annulum crassum mutatis, pedicellis ad 2 mm. longis. Fructus purpureo-ater, fide coll., in sicco etiam glaucus, glaber, tuberculatus, ellipsoideus,  $1.5 \times 1$  cm., calycis reliquiis subtentus, pedicello leviter incrassato pubescente.

BRITISH NEW GUINEA: Western Division, Tarara, Wassi Kussa River, Brass 8589 (TYPE, AA), rain-forest substage, Dec. 1936 (tree 12 m., bark rough, lenticellate; leaves grey underneath; flowers green; fruit purple-black).

This species is the third only of the genus recorded from New Guinea to bear an annular ring of tissue in place of the first and second order of

stamens absent in the flower of *Endiandra*. The other two species are *E. flavinervis* and *E. microphylla*, described by Teschner from Northeastern New Guinea. The former is readily distinguishable because of its glabrous branchlets and smaller, completely glabrous leaves with yellow nerves. From the latter it may be separated by the glaucous lower leaf surface displaying prominent nerves clothed with a pale ferrugineous pubescence. This same pubescence is also marked on the inflorescence, as opposed to the fulvo-tomentose condition on that of *E. microphylla*.

The species is named for Dr. E. D. Merrill, Director of the Arnold Arboretum of Harvard University, whose interest in the Papuanian flora is well known.

***Endiandra glauca* R. Br. Prodr. 402. 1810.**

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7789 (AA), rain-forest outskirts, Sept. 1936 (substage tree, 6–7 m. high; underside of leaves glaucous; flowers red; fruit  $\pm 2 \times 1$  cm., black with a covering of glaucous bloom); same locality and date, *Brass* 7762 (AA), (small tree 3 cm. high, in rain-forest undergrowth; leaves glaucous beneath; flowers pink); Lower Fly River, east bank opposite Sturt Island, *Brass* 8095 (AA), common on dry ridges in rain-forest, Oct. 1936 (weak undergrowth tree [3–5 m.]); leaves glaucous below; fruit hard, black, covered with glaucous bloom); Western Division, Dagwa, Oriomo River, *Brass* 5940 (AA, NY), alt. 40 m., common in creek bank gallery forests, Feb. 16, 1934 (tree 6–7 m., leaves glossy above, very glaucous beneath; flowers red).

The fruit of the specimens from New Guinea are somewhat more slender than those of the Australian species and more tuberculate.

***Endiandra sphaerica*, spec. nov.**

Arbor gracilis ad 15 m. alta, ramulis glabris teretibus striatis griseis, ultimis pubescentibus, plus minusve angulatis brunnescentibus. Folia alternata, lanceolata, 7–14 cm. longa, 2.2–4.5 cm. lata, chartacea, acuminata, basi cuneata, supra glabra, nitida, subtus pilosa vel glabrescentia, glauca, penninervia, nervis 7–8 utrinque subconspicuis, costa supra canaliculata subtus elevata, supra laxe reticulata, petiolis gracilibus canaliculatis 7–12 mm. longis brunnescentibus pubescentibus mox glabris. Inflorescentia ignota. Infructescentia axillaris et terminalis, racemosa, ad 4 cm. longa, glabrescens, pedunculis 1–1.5 cm. longis. Fructus ater et glaucus, fide coll., glaber, globosus, apiculatus, 10–11 mm. diam., calyce persistente horizontaliter patente glabrescente, 6-lobato, pedicellis crassis 4–5 mm. longis.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7512 (TYPE, fruit AA), rain-forest substage, Aug. 1936 (slender tree attaining 15 m.; leaves glaucous below; nerves deeply impressed; fruit black, thickly covered with a glaucous bloom).

The species is near *E. glauca* R. Br. from Australia, but with small globose fruit instead of the oblong fruit of the latter, and with leaves shining on the upper surface.

***Endiandra fulva* Teschner in Engl. Bot. Jahrb. 58: 416. 1923.**

NORTHEASTERN NEW GUINEA: Morobe District, Yunzaing, *Clemens* 2956 (AA), alt. 1220–1525 m., forest hills, April 25, 1936 (tree, dbh. 15 cm.; flower white, 3-merous). NETHERLANDS NEW GUINEA: 6 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh* 12579 (AA), alt. 1300 m., common tree of primary forest on a ridge, Feb. 25, 1939 (tree 25 m. high, diameter 44 cm., with fairly small crown; bark 9 mm. thick, brown, fairly rough; wood red-brown; fruit green).



Teschner's notes indicate that *E. julva* has dark brown bark, yellowish or reddish white flowers, and leaves shining green on both sides with yellow nerves. Brass, on the other hand, does not note the leaf characters apparent in the collection Teschner had at his disposal. Clemens mentions the flower as "white." Teschner describes the leaves as minutely areolate, whereas in the two numbers cited above the leaves are minutely reticulate. These, however, are minor differences which do not exclude them from *E. julva*.

***Endiandra impressicosta*, spec. nov.**

Arbor parva, cortice exfoliato, ramulis glabris griseo-brunneis. Folia alternata, oblongo-lanceolata vel elliptica; (4-)6-10.5(-15) cm. longa, (2-)3.5-5(-6.5) cm. lata, glabra, coriacea, obtuse acuminata, raro acuta vel retusa, basi acuta, saepe inaequali, supra nitida, penninervia, nervis numerosis supra obscuris subtus paullo minus obscuris, costa supra impressissima saepe in sicco subtus elevata fuscior, minute areolata, petiolis crassis ad 1.5 cm. longis atro-rubrescentibus glabris. Inflorescentia axillaris et subterminalis, paniculata, 3-10 cm. longa, multiramosa, multiflora, glabrescens vel minute pallide pubescens, pedunculis ad 2.5 cm. longis, rubescentibus glabrescentibus. Flores  $\pm$  3 mm. longi, gilvi, fide coll., in sicco perianthii lobis glaucis glabrescentibus, pedicellis ad 1 cm. longis pubescentibus. Fructus purpureo-ater, fide coll., glaber, in sicco rugosus, anguste ellipticus vel ovoides, asymmetricus,  $5 \times 2.4$  cm., calyce deciduo pedicello crasso ad 1.2 cm. longo atro-rubescens.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7619 (TYPE, AA), rain-forest canopy, Aug. 1936 (bark hard, brown, exfoliating in small blocks or scales; flowers cream-coloured); Lower Fly River, east bank opposite Sturt Island, *Brass* 8078 (fruit, AA), small tree of flooded river banks in rain-forest, Oct. 1936 (flowers cream coloured; fruit purple-black, narrow, ovoid,  $\pm$  5 cm. long); same locality *Brass* 8224 (AA), a small canopy tree of the ridges in rain-forest, Oct. 1936 (bark brown, thick, somewhat scaly; leaf margins narrowly recurved; fruit smooth, glaucous, black,  $\pm 5 \times 3.5$  cm.).

It is possible that this species belongs to *E. multiflora* Teschner. From the description the following differences manifest themselves. Teschner's species is a tree 20-25 m. high, with grey bark; the leaves may be obovate as well as elliptic and attenuate at the base, never more than 11 cm. long, somewhat shining above with lateral nerves numbering from 8 to 20, often very small and obscure, with the costa white; the petiole is up to 1 cm. long; the flowers are greenish white and the perianth lobes densely pubescent without. Opposing these are the characters of the new species *E. impressinervia*, which is a small canopy tree with hard, brown bark exfoliating in small blocks or scales; the leaves are oblong-lanceolate or elliptic, not attenuate at the base, though frequently unequal, up to 15 cm. long occasionally, shining above, the lateral nerves numbering up to 10, scarcely discernible above, and very faintly so below, with no mention of a white costa by the collector; the petiole is up to 1.5 cm. long; the flowers are cream-coloured and the perianth lobes glabrescent without, and in the dried state definitely glaucous. The latter character would most certainly have been mentioned by Teschner in his description of *E. multiflora* had it been present, for it is one of the striking features of *E. impressicosta*. For

these reasons it has seemed advisable to describe this plant as new. *Brass* 8224 has, on the whole, larger leaves, more conspicuously areolate and less shining on the upper surface.

***Endiandra solomonensis*, spec. nov.**

Arbor ad 20 m. alta, ramulis glabris striatis atro-rubrescentibus. Folia alternata vel opposita, elliptica, 7–12 cm. longa, 3–6.5 cm. lata, glabra, coriacea, obtusa, basi cuneata, saepe inaequali, supra nitida, penninervia, nervis 6–8, utrinque inconspicuis, costa nervisque utrinque conspicuis elevatis, rubescentibus, utrinque dense crasseque reticulata, petiolis paullo crassis 1–1.3 cm. longis atro-rubrescentibus glabris. Inflorescentia axillaris, subterminalis, brevis, paniculata(?), ad 2 cm. longa, laxa, glabra, pauciflora, pedunculis  $\pm$  5 mm. longis gracilibus. Flores 2 mm. longi, glabri, pedicellis 4 mm. longis gracilibus glabris. Fructus ater, nitidus, fide coll., glaber, anguste ovoideus vel ellipsoideus, 4.2 cm. longus, 2.2 cm. diam., fide coll., calycis decidui reliquiis subtentus, pedicello breviter crasso glabro.

SOLOMON ISLANDS: Bougainville: Koniguru, Buin, *Kajewski* 2109 (TYPE, AA), alt. 900 m., common in rain-forest, Aug. 18, 1930 (very large tree up to 20 meters high; well-advanced flower buds on specimens; fruit immature only one on specimens, oval-shaped with a pointed end; common name: "Cum-cogilu"); same locality, *Kajewski* 1998 (AA), alt. 800 m., common in rain-forest, Aug. 1, 1930 (medium-sized tree up to 20 meters high; fruit shining black when ripe, length 4.2 cm., diameter 2.2 cm.; common name: "Mu-eh").

The short slender glabrous inflorescence and the shining coriaceous leaves, so coarsely and conspicuously reticulate as nearly to obscure the very delicate nervation, at once set this interesting species apart. From the description of *E. fulva* Teschner from Northeastern New Guinea, it appears that *E. solomonensis* may be somewhat related, but it is not a certainty.

***Endiandra montana* C. T. White in Contr. Arnold Arb. 4: 36. 1933.**

NETHERLANDS NEW GUINEA: 4 km. sw. of Bernhard Camp, Idenburg River, *Brass & Versteegh* 13142 (AA), alt. 800 m., common tree of secondary rain-forest in the flat plain, March 11, 1939 (tree 24 m. high, diameter 43 cm., crown fairly small; bark 7 mm. thick, grey, shallowly fissured, with a little gum; wood red-brown; fruits green).

The Australian type is a "small twisted and gnarled tree up to 6 m. high" at 1300 m. altitude, while the New Guinean number is a larger tree at 800 m. altitude. There is no other point of difference except perhaps the smoother surface of the fruit found on the plant from New Guinea.

***Endiandra Teschneriana*, spec. nov.**

Arbor, ramulis glabrescentibus teretibus minute papillosis rubescentibus. Folia alternata, elliptica, 11(6–14) cm. longa, 4.5(3–6.5) cm. lata, coriacea, obtuse acuminata vel obtusa, basi cuneata, supra glabra, subtus minute pilosa, mox glabrescentia, demum glabra, penninervia, nervis (6–)10–15, utrinque subinconspicuis, supra dense reticulata, petiolis crassis 1–1.5 cm. longis pubescentibus. Inflorescentia axillaris, brevis, racemoso-paniculata, ad 3.5(–6) cm. longa, pubescens, pedunculis ad 4 cm. longis glabris. Flores  $\pm$  6 mm. longi, extus glabrescentes, perianthii lobis 6, carnosius 3 exterioribus quam 3 interioribus majoribus, staminibus 3, conicalibus. Fructus ignotus.

NORTHEASTERN NEW GUINEA: Wälder der Saugueti Etappe, *Schlechter* 18908 (TYPE, AA), alt. 300 m., Dec. 2, 1908.



A rather fragmentary specimen upon which to base a type. It is distinguished by coriaceous reticulate leaves of which the midrib is prominently elevated on both surfaces and the veins are rather obscure throughout. The rather short racemose paniculate inflorescence seems always to be borne in the axils of subterminal leaves.

**Endiandra Archboldiana**, spec. nov.

Arbor ad 30 m. alta, ramulis glabrescentibus, junioribus pubescentibus, paulo sulcatis minute papillosis brunnescentibus. Folia alternata, elliptica vel oblongo-elliptica, 8–15 cm. longa, 4.5–8.5 cm. lata, glabra, coriacea, obtuse acuminata, basi obtusa, saepe acuta, inaequalia, subtus nitida, penninervia, nervis 4–6, supra plus minusve impressis subtus elevatis pallide-rubrescentibus, costa rubescente, utrinque conspicue minute reticulata, petioli crassis canaliculatis ad 1.5 cm. longis rubescentibus glabris, junioribus adpresse fulvo-pubescentibus. Inflorescentia subterminalis, axillaris, paniculata, ad 7 cm. longa, minute adpresse fulvo-pubescentis, pauciflora, floribus in ramulis summis dense aggregatis, pedunculis ad 2 cm. longis rubescentibus. Flores = 2 mm. longi, flavi, fide coll., fulvo-pubescentes, pedicellis  $\pm$  2 mm. longis pubescentibus. Fructus ignotus.

BRITISH NEW GUINEA: Central Division, Dieni, Ononge Road, *Brass 3813* (TYPE, AA, NY), alt. 500 m., common in rain-forests, April 20, 1933 (tree 30 m. or more, with thick, grey, lenticellate bark; wood pale, soft; leaves smooth above, shining beneath; flowers small, yellow; fruit not seen).

*Endiandra Archboldiana* is distinguished by its minutely reticulate leaves, shining below, and its somewhat short fulvo-pubescent inflorescence with rather few flowers densely clustered at the tips of the floral branchlets. There seems to be no species with which the above may claim close relationship. The petals under great magnification show the presence of oil glands throughout. To date the majority of species described in the family have not given a detailed picture of the floral parts. Hence, it is impossible to indicate any relationship on this basis. With type material available it is possible that this character may in the future assume a taxonomic significance heretofore ignored.

**Brassiodendron**, gen. nov.

Arbores. Folia opposita vel alternata, simplicia, papyracea, penninervia. Ramuli graciles, teretes. Inflorescentia axillares vel subterminales, racemosa vel paniculatae, sine involucris. Flores hermaphroditi; perianthii lobii 6. subaequales, carnosii, tubo brevi; stamina 6, exterioribus quam interioribus majoribus introrsis, interioribus extrorsis, series tertia quartaque nullae; antheris 2-loculatis; ovarium irregulariter ovoideum, stigma sessile, ovulo solitario pendulo oblongo angulato.

TYPE SPECIES: *Brassiodendron fragrans* Allen.

**Brassiodendron fragrans**, spec. nov.

Arbor gracilis ad 20 m. alta, ramulis glabris teretibus striatis olivaceis. Folia opposita vel alternata, plana, fide coll., lanceolato-elliptica, papyracea, acuminata vel obtuse acuminata, raro obtusa vel rotundata, basi cuneata, utrinque glabra, supra olivacea, opaca, subtus nitida, pallida, penninervia, nervis  $\pm$  15 utrinque plus minusve obscuris supra leviter impressis inconspicuis subtus concoloribus leviter elevatis, costa utrinque conspicua

brunnea supra canaliculata subtus elevata, utrinque laxe conspicueque reticulata, petiolis gracilibus 7(-10) mm. longis brunnescentibus glabris. Inflorescentia axillaris et subterminalis, racemosa vel racemoso-paniculata, 2(-3) cm. longa, plerumque 1.5 cm. lata, minute inconspicueque pubescens 2-3-flora, pedunculis ad 1 cm. longis. Flores 6-7 mm. longi, gilvi et fragrantés fide coll., utrinque glabri, corolla ad anthesin patente, perianthii lobis 6, carnosus, margine translucente, glanduloso-punctatis, ad 4 mm. longis, tubo 1 mm. longo, staminibus 6, sessilibus, plus minusve oblongis vel oblongo-lanceolatis utrinque minute glanduloso-papillosus, 3 exterioribus introrsis, 2.5 mm. longis, 3 interioribus extrorsis, saepe ut videtur plus minusve cum petalis perpendicularibus,  $\pm$  1.5 mm. longis, ovarium irregulariter ovoideum, stigma subsessile. Inflorescentia ♀ et fructus ignoti.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7465 (TYPE ♂, AA), rain-forest subcanopy, Aug. 1936 (rather slender tree 20 m. tall; bark brown, lenticellate, slightly fissured; leaves flat, glossy below; flowers cream coloured, fragrant).

The genus is close to *Endiandra*, but differs in having six perfect stamens instead of three, the three interior being definitely smaller. There is an absence of the third series of stamens as well as staminodia and there is no appearance of glands. The species is distinguished by coarsely and prominently reticulate papery leaves, glossy below, with nervation inconspicuous above and slightly more so below. The short, few-flowered usually racemose, occasionally racemose-paniculate inflorescences without bracts, and the fragrant flowers with fleshy perianth lobes which are thinner and somewhat transparent at the margin are presumably specific characters.

The genus is named in honor of Mr. L. J. Brass, the botanical collector of the Archbold Expeditions into New Guinea.

### *Cassytha* Linnaeus

*Cassytha filiformis* Linnaeus, Sp. Pl. 1: 35. 1753; Nees, Syst. Laurin. 642. 1836; Meissner in DC. Prodr. 15<sup>1</sup>: 255. 1864; K. Schum. Notizbl. Berl. 1: 49. 1895; Warburg in Engl. Bot. Jahrb. 13: 315. 1895; K. Schum. Notizbl. Berl. 2: 117. 1898; K. Schum. & Lauterb. Fl. Deutsch. Schutz. Südsee 334. 1901; Val. Bull. Dept. Agr. Ind. Neerl. 10: 13. 1907; Reching. Denkschr. Math. Nat. Kl. Ak. Wiss. Wien. 85: 283. f. 12. (Reprint Bot. Zool. Ergeb. Samoa. 3: 109) 1910; C. T. White in Proc. Roy. Soc. Qld. 35: 31. 1922; Schmidt in C. T. White, Jour. Arnold Arb. 10: 216. 1929.

*Cassytha filiformis* L. var. *β subpubescens* Meissner in DC. Prodr. 15<sup>1</sup>: 255. 1864.

*Cassytha filiformis* L. var. *pubescens* K. Schum. & Holtr. Fl. K. W. Land 43. 1889.

BRITISH NEW GUINEA: Middle Fly River, Lake Daviumbu, *Brass* 7802 (AA), parasite on underbrush of forest borders, Sept. 1936; coast between Oriomo and Fly Rivers, *Brass* 6417 (AA), parasitic in large quantities on low vegetation along beaches, March 31, 1936; Western Division, Tarara, Wassi Kussa River, *Brass* 8639 (AA), grass parasite in savannah-forests; abundant on wet flats, Jan. 1937; Wuoi Oriomo River, *Brass* 5795 (AA, NY), alt. 10-30 m., on small trees of savannah-forest patches Jan.-March, 1934 (stems smooth green); Gulf Division, Maclatchie Point, *Brass* 1180 (AA), on beach trees, March 19, 1926; Eastern Division, Bomgwina, *Brass* 1615 (AA), on *Ipomoea pes-caprae*, June 1, 1926. NETHERLANDS NEW GUINEA: Hollandia, *Brass* 8886 (AA), alt. 20-100 m., abundant on small trees and shrubs of secondary savannahs, June 29, 1938.

SOLOMON ISLANDS: San Cristobal: Star Harbour, *Brass* 3069 (AA), very plentiful in loose coral sand near the sea, Oct. 18, 1932 (trailing over sand or climbing and twining on low beach vegetation).



The following numbers from British New Guinea, *Brass* 5795, 8639 and from Netherlands New Guinea, *Brass* 8886, probably belong with the widespread *C. filiformis*, though they vary in slight detail such as outline of calyx-lobes and bracteoles. Since the age of the plant causes pubescence to vary, the variety *β subpubescens* has become a part of the species.

**Cassytha Archboldiana**, spec. nov.

Parasitica aphylla, caulibus sat gracilibus, 5 mm. crassis, ramosis, glabris vel glabrescentibus, ramulis junioribus dense fulvo-tomentellis. Inflorescentia solitaria vel gemina, paniculata, pedunculata, ad 7-flora, paniculis ad 2 cm. longis, pedunculis erectis ramosis, pubescentibus, paniculis et ramulis pubescentibus, bracteis 3, ad 1 cm. longis acutis, pubescentibus subtentibus, floribus 2–6, 2 mm. longis sessilibus, 1–2 mm. distantibus paniculae apice bracteolis 3 triangularibus acutis ciliolatis pubescentibus subcarinatis, 0.7 mm. longis, perianthii lobis exterioribus 3, ovatis ciliolatis, subcarinatis, 0.5 mm. longis, interioribus 3, ovalibus acutis glabris subcarinatis, margine minute papillois, staminibus 9, 6 exterioribus 1.5 mm. longis, bilocularibus, introrsis, 3 interioribus 1 mm. longis, abortivis, cum exterioribus alternatis, 3 staminodiis anguste ovatis, biglandulosis; ovario ellipsoideo, stylo gracile. Fructus subglobosus 5 mm. longus, 4 mm. latus, glaber, bracteolis persistentibus subtentus, perianthii lobis plus minusve erectis persistentibus coronatus.

NETHERLANDS NEW GUINEA: Balim River, *Brass* 11675 (TYPE, AA), alt. 1600 m., common on grass and shrubs, Dec. 1938.

The species differs from the widespread *C. filiformis* L. and the Australian *C. paniculata* in having branched inflorescences which are 2 cm. or less in length. The tawny-pubescent young shoots are also distinctive.

**Cassytha tenuis**, spec. nov.

Parasitica aphylla, caulibus tenuibus, minusquam 0.3 mm. crassis, glabris obsolete striatis. Inflorescentia solitaria, spicata, pedunculata, pauciflora (1–3), spicis 10–12 mm. longis, pedunculis erectis filamentosis, cano-pubescentibus, bracteis 3 minutis, acutis, ciliolatis, subtentibus, floribus 1–3, 1–1.5 mm. longis, sessilibus, 0.5–1.5 mm. distantibus in tantum aggregatis apice spicae, bracteolis 3 ovatis acutis ciliolatis, 1 mm. longis, perianthii lobis exterioribus 3, ovatis glabris, 1.5 mm. longis, margine minute papillois, staminibus 9, 0.5 mm. longis, antheris bilocularibus, 6 exterioribus introrsis 3 interioribus alternatis 3 staminodiis rotundatis, biglandulosis; ovario ellipsoideo, stylo gracile. Fructus subglobosus, 3.5 mm. longus, 3 mm. latus sparse cano-pubescentibus, bracteolis persistentibus subtentus, perianthii lobis plus minusve erectis persistentibus coronatus.

BRITISH NEW GUINEA: Western Division, Mabaduan, *Brass* 6514 (TYPE, AA), parasitic on grass in savannah-forests and forming tangles close to the ground, April 1936.

*Cassytha tenuis* resembles *C. capillaris* L. from Malaya vegetatively, but the branches are even more slender and the inflorescence is pedunculate rather than sessile as in the former species. The dense whitish pubescence on the peduncles of the inflorescence and the sparse whitish pubescence of the mature fruit of the Papuan species are also outstanding.

## RECORDS OF INDO-CHINESE PLANTS, III\*

E. D. MERRILL

THIS paper is to a large degree based on material submitted by Dr. A. Pételot for identification. In it are recorded about forty-five species originally described from extra-limital sources, these being new records for Indo-China. Forty-three species and varieties are described as new. Certain changes are made in nomenclature for previously described species and some are reduced to synonymy. The types of the new species herein described are deposited in the herbarium of the Arnold Arboretum.

## ARACEAE

***Cryptocoryne longispatha* sp. nov. § *Bitubulosae*.**

Planta ut videtur submersa, rhizoma verticali, circiter 6 mm. crassa, internodiis 2–5 mm. longis; foliis in vivo undulatis, haud bullatis sed in sicco distanter transversim subplicatis, olivaceis, membranaceis, anguste oblongo-lanceolatis, oblongo-oblanceolatis vel lineari-lanceolatis, 17–22 cm. longis, 1.2–1.8 cm. latis, acutis vel leviter acuminatis, deorsum longe angustatis, basi cuneatis vel decurrentibus, costa circiter 1.5 mm. lata, nervis lateralibus utrinque 3 vel 4, angulo acutissimo a costa abeuntibus, adscendentibus, distantibus, gracilibus, obscuris, nervulis transversalibus gracilibus, obscuris, distantibus, vel subobsoletis; petiolo 8–12 cm. longo, deorsum longe vaginato; pedunculo 4–5 cm. longo; spathae tubo inferiore circiter 1.5 cm. longo, superiore 14–18 cm. longo, 3–4 mm. amplo (plano) laevi, haud transverse rugoso, lamina anguste lanceolata, 2.5–3 cm. longa, longissime anguste caudata, deorsum laxa, ad apicem subconfertim spiraliter contorta, spadicebus 1.5–2 cm. longis, stigmatibus sessilibus vel breviter stipitatis, partibus masculinis ellipsoideis, circiter 3.5 mm. longis, 2.5 mm. diametro, graciliter stipitatis, stipite 8–10 mm. longo.

INDO-CHINA, Tonkin, Thoi Nguyen Province, Phan Mê, *Pételot 2681*, Nov. 12, 1939, the plants deeply buried in the sand, along the borders of streams, the undulate leaves floating.

A species apparently belonging in the group with *Cryptocoryne retrospiralis* (Roxb.) Fisch. and *C. crispatula* Engl., the latter being the only representative of the genus hitherto recorded from Indo-China (Laos and Bien-hoa). It differs from the latter in its much broader leaves and longer peduncles. From the blanched petioles it is suspected that the lower parts of the plant were buried in the sand to a depth of up to 10 cm. The dried leaves are not, or at most very slightly bullate, and the undulate character mentioned by the collector is reflected in the dried specimens by the characteristic narrow, irregular and distant transverse plicae which at first sight simulate straight lateral nerves, the folds being so very narrow.

\*For the earlier papers in this series see *Jour. Arnold Arb.* **20**: 347–355. 1939; **21**: 364–391. 1940.



## LILIACEAE

**Paris Delavayi** Franch. Jour. de Bot. **12**: 190. 1898.

INDO-CHINA, Tonkin, Chapa, *Pételot* 6195, April 1936, humid places in forests, alt. 1500 m. Yunnan, Szechuan, and neighboring provinces in China, the type from Szechuan.

**Paris Fargesii** Franch. Jour. de Bot. **12**: 190. 1898.

INDO-CHINA, Tonkin, Chapa, *Pételot* 6196, April 1936, humid places in forests, alt. 1500 m. Yunnan, Szechuan, and Kweichow, the type from Yunnan.

**Paris hainanensis** Merr. Philip. Jour. Sci. **23**: 238. 1923.

INDO-CHINA, Tonkin, Chapa, *Pételot* 6194, April 1936, in humid places in open forests, alt. 1500 m. Hainan.

It is of interest to note that in 1934, when the Liliaceae of Indo-China was treated by Gagnepain, no representative of this genus was known from that country, but two years later Dr. Pételot collected three distinct species in the same general locality, Chapa, in northern Tonkin.

**Pleomele terniflora** (Roxb.) comb. nov.

*Dracaena terniflora* Roxb. Hort. Bengal. 24. 1814, *nomen nudum*, Fl. Ind. ed 2, **2**: 159. 1832; Kurz, For. Fl. Brit. Burma **2**: 545. 1877; Hook. f. Fl. Brit. Ind. **6**: 329. 1892.

INDO-CHINA, Tonkin, Sontoy Province, Da Chong, *Pételot* 2663, April 14, 1940, in shrubby savannas. Silhet and Khasia to Burma.

Baker, Jour. Bot. **11**: 263. 1873, manifestly by error, placed this as a synonym of the distinctly different *Dracaena spicata* Roxb., while Hooker f., Fl. Brit. Ind. **6**: 329. 1892, recognized Roxburgh's two species as distinct, but indicated difficulties in determining the exact status and relationships of *D. terniflora* Roxb. Pételot's material agrees rather closely with the original description and with Kurz's consideration of 1877. Roxburgh's type was from Silhet. The indicated distribution is that given by Hooker f. From Gagnepain's description of *Dracaena elliptica* Thunb., Lecomte, Fl. Gén. Indo-Chine **6**: 800. 1934, it is suspected that he included other than the typical form of that species, but his description scarcely covers the form that I here refer to Roxburgh's species.

*Pleomele* Salisbury is a very narrow generic segregate from *Dracaena* Vandelli, and few botanists have followed N. E. Brown, Kew Bull. **1914**: 273-279. 1914, in reinstating Salisbury's genus. He transferred to it, without discussion of the synonymy of the numerous species, and without literature citations, about one hundred species originally described by various authors under *Dracaena*.

## MORACEAE

**Cudrania fruticosa** Wight ex Kurz, For. Fl. Brit. Burma **2**: 434. 1877; Hook. f. Fl. Brit. Ind. **5**: 539. 1888; Schneider in Sargent, Pl. Wils. **3**: 307. 1916.

INDO-CHINA, Tonkin, Langson Province, Dong Mo, *Pételot* 6615, Nov. 8, 1940, a spiny shrub with scandent branches on calcareous formations. Eastern Bengal to Burma and Yunnan.

It may be that Kurz, in publishing *Cudrania fruticosa* Wight, intended to base it on *Batis fruticosa* Roxb. Fl. Ind. ed. 2, **3**: 763. 1832, but if so he failed to cite the latter. Hooker f. placed *Batis fruticosa* Roxb. as a doubt-

ful synonym; Roxburgh's description is altogether too short to judge what he may have intended to describe, but Roxburgh's species may well be the same as *Cudrania fruticosa* Wight.

**Ficus heterostyla** sp. nov. § *Covellia*.

Arbor, partibus junioribus foliis subtus et infructescentiis castaneo-hirsutis, ramulis ultimis circiter 5 mm. diametro, consperse hispido-hirsutis; foliis oppositis, 25–30 cm. longis, 10–14 cm. latis, chartaceis, oblongo-obovatis, subabrupte graciliter (2.5–3 cm.) subcaudato-acuminatis, basi aequilateralibus vel leviter inaequilateralibus, obtusis vel subrotundatis, subtrinerviis, margine dentatis, dentibus parvis, 3–5 mm. distantibus, junioribus penicillatis, supra subasperis, olivaceis, ad costam subdense in parenchymate conspersissime hispido-hirsutis, pilis plerumque castaneis rigidis 1–2 mm. longis, subtus pallidioribus, praesertim ad costam nervosque perspicue hispido-hirsutis, pilis rigidis subferrugineis vel castaneis, in parenchymate pallidioribus brevioribusque; nervis primariis utrinque circiter 8, subtus perspicuis, elevatis, circiter ad marginem arcuato-anastomosantibus, nervis secundariis subparallelis, distantibus, reticulis subdistinctis; petiolo 5–6 cm. longo, hispido-hirsuto; stipulis oblongo-lanceolatis, caudato-acuminatis, circiter 2 cm. longis, extus in partibus expositis breviter adpresse hirsutis, carinatis, ad carina longe castaneo-hirsutis; fructibus in ramis specialibus efoliatis e basi trunco ortis, ut videtur epigeis, elongatis, ramis ultimis 8–20 cm. longis, partibus vetustioribus glabris vel glabrescentibus, junioribus perspicue hispido-hirsutis, pilis rigidis, castaneis, bracteis in ramulis ultimis oppositis, oblongo-ovatis, acutis vel acuminatis, 6–8 mm. longis, extus adpresse-hirsutis, superioribus plus minusve imbricatis, internodiis in ramulis ultimis 1–4 cm. longis, in axibus primariis saltem ad 12 cm. longis, ramulis ultimis plerumque oppositis; receptaculis obovoideis, circiter 1.5 cm. longis, pedunculatis, apice rotundatis, basi subacutis, in sicco castaneis et hispido-hirsutis, pilis castaneis, rigidis, circiter 1 mm. longis; bracteis suborbicularibus vel suborbiculari-reniformibus, rotundatis, ad 3.5 mm. longis et 4 mm. latis, extus plus minusve hirsutis, intus glabris, margine plus minusve scariosis, pedunculo 5–7 mm. longo, hispido-hirsuto; floribus ♂ paucis, 2–3 mm. longis, perianthio 0, antheris oblongo-ellipticis, 1 mm. longis; ♀ pedicellatis, pedicellis 1–2 mm. longis, glabris, perianthio 0, ovario obovoideo, leviter inaequilateraliter rotundato, circiter 1.2 mm. longo, stylis lateralibus, simplicibus, distincte hirsutis, 1 mm. longis; floribus cecidiferis ♀ simillimis sed stylis brevissimis (0.25 mm. longis) glabris.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot 2569* (TYPE), 5664, March 1936, and June 1940, in forests, alt. 400–500 m., the fruits on long branches from the base of the trunk.

It is possible that this form was included by Gagnepain in his concept of the common and widely distributed *Ficus hispida* Linn. f., and in fact, one of the cited specimens was received under that name. As *Ficus hispida* Linn. f. is described and illustrated by King, Wight, Roxburgh, and others, I am convinced that this Indo-Chinese form with elongated special apparently epigeous fruiting branches from the base of the trunk cannot be referred to the Indo-Malaysian *F. hispida* Linn. f., with relatively short inflorescences on the trunk and larger branches. This Indo-Chinese species differs also in its castaneous indumentum on the branchlets, leaves, infruc-



tescences and receptacles, as well as in its rather slenderly subcaudate-acuminate differently shaped leaves. It has in common with *Ficus hispida* Linn. f. the elongated styles of the pistillate flowers being distinctly ciliate-hirsute, while those of the gall flowers are very much shorter and entirely glabrous; this character holds for *Ficus hispida* Linn. f. and some other species of the section, such as *Ficus stolonifera* King, *F. Treubii* King, and *F. saemocarpa* Miq. As in other species of the *Covellia* group, gall flowers only occur in one set of receptacles, and staminate and fertile female flowers in others. In the currently accepted synonymy of *Ficus hispida* Linn. f., apparently *F. oppositifolia* Willd., at least as illustrated by Roxburgh, Pl. Coromandel 2: 14. t. 124. 1798 and by Wight, Ic. 2(4): 1. t. 638. 1844, and *F. daemonum* Koenig, as illustrated by Wight, op. cit. t. 641, are correctly placed. *Ficus hispida* Jacq. Hort. Schoenbr. 3: t. 315, certainly does not represent any species of the section *Covellia*.

***Ficus pubilimba* sp. nov. § *Urostigma*.**

Arbor ut videtur semi-epiphytica, ramis glabris, rugosis, ramulis ultimis hirsutis, rugosis, circiter 3 mm. diametro, stipulis caducis, terminalibus alabastrum simulantibus, oblongo-ovatis vel ovato-lanceolatis, acuminatis, coriaceis, extus hirsutis intus glabris; foliis alternis, coriaceis, integris, oblongis vel oblongo-ellipticis, 7–14 cm. longis, 3–5.5 cm. latis, in sicco pallidis, utrinque subaequaliter angustatis, basi acutis vel late acutis, breviter 3-nerviis, apice breviter late obtuseque acuminatis vel obtusis, supra glabris vel secus costam nervosque ciliato-hirsutis glabrescentibus, subtus distincte molliter pubescentibus, pilis brevibus, erectis vel patulis; nervis primariis utrinque perspicuis, subtus cum costa elevatis, circiter ad marginem arcuato-anastomosantibus, 1–2 cm. distantibus, secundariis reticulisque leviter elevatis; petiolo 1.5–3 cm. longo, pubescenti; receptaculis axillaribus, sessilibus, solitariis vel binis, globosis, glabris, 8–10 mm. diametro, bracteis 3, subreniformibus, late rotundatis, glabris vel obscure pubescentibus, circiter 2 mm. latis et 1.5 mm. longis; floribus ♂ paucis, staminibus solitariis, filamentis brevissimis, antheris suborbicularibus, 0.5 mm. diametro, perianthii segmentis 3, obovatis, subcucullatis, rotundatis, circiter 1.5 mm. longis; floribus ♀ cecidophorisque, cum pedicellis, 2–3 mm. longis, sepalis 3, oblongis vel oblongo-obovatis, rotundatis, circiter 1.5 mm. longis, ovarium subglobosum involucrantibus.

INDO-CHINA, Tonkin, Bac Giang Province, near a pagoda in the environs of Kep, Pételot 5732, Feb. 27, 1936.

I have not been able to place this specimen as representing any of the Indo-Chinese species admitted by Gagnepain, nor can I place it as representing any other described species. By King's arrangement of the Indo-Malaysian species it falls in his series one, subseries four, in the general alliance with *Ficus indica* Linn., from which it is readily distinguished by its indumentum and its small subtending receptacle bracts.

#### PROTEACEAE

***Helicia hainanensis* Hayata, Ic. Pl. Formos. 9: 87. 1920.**

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, Pételot 2619, July 2, 1940, a tree 7–8 m. high, in open forests, alt. 700 m. Kwangsi, Kwangtung, and Hainan.

***Helicia brevipetiolata* sp. nov.**

Arbor glabra, circiter 12 m. alta, ramis teretibus, pallide viridibus, obscure longitudinaliter striatis ramulis ultimis circiter 2 mm. diametro; foliis oblongo-obovatis, firmiter chartaceis, 17–25 cm. longis, 7–10 cm. latis, acuminatis, in sicco utrinque subconcoloribus, pallide viridibus, apice acuminatis, deorsum plus minusve angustatis, basi abrupte rotundatis circiter 1–1.5 cm. latis, margine distanter subcalloso-serratis, dentibus ad 2 mm. longis, 1–3 cm. distantibus; nervis primariis utrinque 9–10, distantibus, subtus elevatis, perspicuis, curvato-arcuatis, anastomosantibus, reticulis primariis laxis, sub lente distinctis; petiolo circiter 5 mm. longo, 4 mm. crasso, transverse subplicato-rugoso; racemis in axillis superioribus, glaberrimis, breviter (2–2.5 cm.) pedunculatis, multifloris; floribus circiter 1.7 cm. longis, pedicellis circiter 3 mm. longis, deorsum per paria connatis, bracteis lanceolatis, acuminatis, vix 1 mm. longis, deciduis, bracteolis deciduis, quam bracteis duplo brevioribus; ovario glabro, anguste ovoideo, stylo 1.5 mm. longo; antheris lineari-oblongis, 3 mm. longis; disci glandulis liberis, oblongo-ovatis, circiter 0.7 mm. longis, obtusis.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 2628, June 4, 1940, altitude about 150 m.

A species with free disk scales, falling in the group with *Helicia tonkinensis* Lecomte but totally different from that and the closely allied *H. cochinchinensis* Lour. in its much larger, prominently toothed leaves. The short very stout petioles are transversely subplicate-rugose.

## ARISTOLOCHIACEAE

***Asarum glabrum* sp. nov.**

Planta glabra, caulibus erectis, saltem 2–3-foliatis, 4–5 mm. diametro; foliis longe (10–12 cm.) petiolatis, ovatis, basi profunde cordatis, sursum angustatis et acute acuminatis, 12–21 cm. longis, 7–11 cm. latis, chartaceis, lobis basalibus rectis vel paullo divaricatis, oblongis vel ovatis, late rotundatis, 4–5 cm. longis, 3–4.5 cm. latis, nervis basalibus 3, lateralibus curvato-adscendentibus, subtus elevatis laxè subobscure reticulatis, venulis haud elevatis, additis binis in lobos basales extendentibus; floribus in axillis superioribus, solitariis, ut videtur erectis, tubo ovoideo, subfructu 3–3.5 cm. longo, ad 2.5 cm. diametro, basi late acuto vel subrotundato, lobis ovatis, obtusis vel subrotundatis, circiter 3 cm. longis et 2 cm. latis, longitudinaliter 7-nerviis, utrinque glabris, intus ad basim dense papillatis, papillis oblongis, circiter 1 mm. longis; seminibus obovoideis, 5 mm. longis; pedicellis circiter 3 cm. longis, sub fructu sursum incrassatis, curvatis; bracteis lanceolatis, acuminatis, 1.8 cm. longis, margine sursum plus minusve ciliatis.

INDO-CHINA, Sontoy Province, Mount Bavi, *Pételot* 2611, July 2, 1940, in open forests, altitude about 600 m.

A species characterized by its long petioled leaves laxly arranged on the upper parts of the stems, the leaf blade being gradually narrowed upward to the sharply acuminate apex, the broadly rounded basal lobes being parallel or only slightly diverging, as well as by being glabrous throughout except for the slightly ciliate bracts. The perianth lobes are ovate, rounded or broadly obtuse, glabrous on both surfaces, distinctly 7-nerved, and characteristically densely papillate on the base inside.



***Asarum reticulatum* sp. nov.**

Glabra, rhizomate repente, radicante, caulibus adscendentibus, brevibus, simplicibus vel depauperato-ramosis, ad 3 mm. diametro; foliis anguste ovatis vel late oblongo-ovatis, chartaceis, utrinque glabris, 10–15 cm. longis, 6–7 cm. latis, acutis vel breviter acute acuminatis, basi cordatis, lobis vix vel leviter patulis, ovatis, rotundatis, 2.5–3.5 cm. longis, 2.5–3 cm. latis, nervis primariis basalibus 3, perspicuis, subtus elevatis, laxe arcuato-anastomosantibus, additis binis paullo gracilioribus in lobos basales extendentibus, subtus laxe perspicue reticulatis, venulis elevatis, distinctis, reticulis primariis 5–10 mm. diametro; petiolo 6.5–7 cm. longo; perianthii tubo 3–3.5 cm. longo, extus glabro, anguste campanulato, basi acuto, 1.8 cm. lato (compressio) fauce leviter constricto ut videtur depresso, lobis late ovatis, rotundatis, circiter 2 cm. longis latisque, utrinque glabris, basi intus subtransverse verruculosis, pedicellis circiter 2 cm. longis; bracteolis lanceolatis, acuminatis, circiter 1.5 cm. longis, saltem ad marginem plus minusve ciliato-hirsutis.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2554, April 1935, in mossy humus, open forests, altitude about 1500 m.

In general characterized by being glabrous throughout, the leaves prominently and laxly reticulate beneath, the perianth about 4 cm. wide, the lower half of the lobes inside transversely verruculose, the lobes broadly ovate or orbicular-ovate, rounded, and about 2 cm. in diameter.

Lecomte, *Fl. Gén. Indo-Chine* **5**: 53. 1910, admitted a single species of this genus from Indo-China, *Asarum Balansae* Franch., type from Mount Bavi; this species is also represented by *Pételot* 2555 from the type locality. O. C. Schmidt, *Notizbl. Bot. Gart. Berlin* **11**: 100. 1931, recorded *Asarum caudigerum* Hance from Tonkin and described *A. Petelotii* O. C. Schmidt from Tam Dao, Tonkin, based on *Pételot* 3891. With the description of the above two new species the total number now known from Indo-China is five.

## POLYGONACEAE

***Polygonum macranthum* Meisn. in DC. Prodr. **14**: 107. 1856.**

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 6601, Nov. 1, 1940, in humid places, alt. 700 m. Northern India, western and central China, and Japan.

***Polygonum Thunbergii* Sieb. & Zucc. Fl. Jap. Fan. Nat. **2**: 84. 1846; Steward, Contr. Gray Herb. **5**(88): 83. 1930, *cum syn.***

INDO-CHINA, Tonkin, Chapa, *Pételot* 1622, July 1924, alt. 1500 m. Assam, through China to Sakhalin, Japan and Formosa, southward to Sumatra.

Danser, *Bull. Jard. Bot. Buitenz. III. **8**: 224. f. 14. 1927*, accepted the binomial *Polygonum hastatotrilobum* Meisn. (1865) for this species, which Steward, op. cit. 84 places as *P. Thunbergii* Sieb. & Zucc. var. *hastatotrilobum* (Meisn.) Maxim. Steward cites *Pételot*'s number, having seen the specimen in the University of California herbarium.

***Polygonum praetermissum* Hook. f. Fl. Brit. Ind. **5**: 47. 1886; Steward, Contr. Gray Herb. **5**(88): 86. 1930.**

INDO-CHINA, Tonkin, Balyn pagoda, near Hanoi, *Pételot* 791, Nov. 1922. India and Ceylon to Japan, southward to Luzon, but as yet not recorded from the Malay Archipelago.

The leaves of the cited specimen are twice as large as Steward admits for Hooker's species, yet I believe that the material is properly placed under *Polygonum praetermissum* Hook. f.

**Rumex nepalensis** Spreng. Syst. **2**: 159. 1825; Meisn. in DC. Prodr. **14**(1): 55. 1856; Wight, Ic. **5**(2): 8. t. 1810. 1852; Hook. f. Fl. Brit. Ind. **6**: 60. 1886.

INDO-CHINA, Tonkin, Chapa, *Pételot 2549*, August 1940, along roads, altitude about 1500 m. Northern India to western and central China.

The cited specimen agrees very closely with a large series of Yunnan collections, but *Pételot 2549* and most of the Yunnan material differ from Sprengel's species as currently described, and as illustrated by Wight, in the unbranched inflorescences and in the lower leaves being rounded rather than cordate.

#### ANNONACEAE

##### **Artabotrys Petelotii** sp. nov.

Frutex scandens partibus junioribus et foliis subtus plus minusve pubescentibus, ramis teretibus, glabris vel subglabris, ramulis ultimis 1.5–2 mm. diametro, dense breviter pubescentibus; foliis chartaceis, plerumque oblongis vel oblongo-ellipticis, aliquando deorsum leviter angustatis, 9–14 cm. longis, 3–5.5 cm. latis, obtuse acuminatis, basi late acutis, supra nitidis, glabris vel secus costam breviter pubescentibus, in sicco pallidis, subtus subopacis praesertim secus costam nervosque consperse molliter breviter pubescentibus; nervis primariis utrinque 9–12, distantibus, curvatis, subtus elevatis, perspicuis, arcuato-anastomosantibus; inflorescentiis oppositifoliis, uncatis, ligneis, pubescentibus, 1-floris; floribus flavidis, pedicellis circiter 8 mm. longis, pubescentibus, sursum incrassatis; sepalis ovatis, acuminatis, 4.5–5 mm. longis, coriaceis, extus pubescentibus, intus subglabris vel leviter pubescentibus; petalis crassissime coriaceis, utrinque dense breviter subcinereo-pubescentibus, exterioribus 2 cm. longis, oblongo-lanceolatis, obtusis, planis, 6 mm. latis, basi cupulatis, intus glabris, petalis interioribus minoribus, subteretibus vel leviter compressis, ad 2 mm. crassis, rectis vel leviter curvatis, partibus basalibus planis, intus glabris, extus ad basin partibus liberis distincte subauriculatis; staminibus numerosis, 2 mm. longis, deorsum angustatis, connectivo circiter 1 mm. diametro, subtruncato-convexo; carpellis circiter 6, oblongo-ovoideis, densissime adpresse hirsutis; stylis crassis, 1 mm. longis, glabris, subteretibus.

INDO-CHINA, Tonkin, Bac Giang Province, near Pho Vi, *Pételot 4857*, June 1933, a large vine with yellow flowers, in forests.

The alliance of this species is clearly with *Artabotrys uniflorus* (Griff.) Craib, Kew Bull. 435. 1915, described and well illustrated by King, Ann. Bot. Gard. Calcutta **4**: 47. t. 62. 1893 as *A. burmanicus* (non A. DC.), one of the few species in this alliance that has densely hirsute ovaries. It differs in its somewhat smaller flowers, relatively broader outer petals and relatively narrower, almost terete, inner ones, and its bluntly, rather than acutely acuminate leaves, the main nerves interarching once within the margins, not twice as in Griffith's species. Gagnepain gives a very brief description of *A. burmanicus* A. DC. on the basis of *Pierre 104* from Siam, a fruiting specimen, giving its range as "Toute la Presqu'île Malaise." Ridley does not admit the species in his Flora of the Malay Peninsula, and

Craib, Fl. Siam. Enum. **1**: 33. 1925. states that Gagnepain's description does not apply to *Artabotrys burmanicus* A. DC., but that it suggests *A. siamensis* Miq., and does not admit the former as definitely occurring in Siam. *A. burmanicus* A. DC. is a species quite distinct from *A. uniflorus* (Griff.) Craib.

***Desmos monogynus* sp. nov.**

Frutex 5-6 m. altus, perspicue subcastaneo-villosus, ramis vetustioribus glabris, ramulis dense villosis, circiter 2 mm. diametro; foliis oblongis, chartaceis, 11-17 cm. longis, 3.5-6 cm. latis, in sicco supra pallidis, glabris, subtus subcastaneo-brunneis, praesertim secus costam nervosque dense villosis, apice breviter acuminatis, basi rotundatis et minute cordatis; nervis primariis utrinque 13-15, supra haud distinctis, subtus elevatis, perspicuis, circiter ad marginem arcuato-anastomosantibus; petiolo dense villosio, crasso, 3-4 mm. longo; floribus axillaribus, solitariis, brevissime pedicellatis; sepalis triangulari-ovatis, obtusis, circiter 6 mm. longis et 5 mm. latis, intus glabris, extus adpresse hirsutis, margine ciliatis; petalis lanceolatis circiter 3 cm. longis, extus adpresse villosis, intus glabris, exterioribus 8 mm., interioribus 10 mm. latis, sursum angustatis, obtusis; staminibus numerosis, cuneatis, 2 mm. longis, connectivo obliquo, truncato, cellulis extrorsis; carpellis solitariis, oblongis, 3 mm. longis, plus minusve compressis, adpresse hirsutis, sursum leviter angustatis; stigmatibus sessilibus, depresso-globosis, leviter hirsutis; ovulis 2-seriatis, numerosis; fructibus dense subcastaneo-pubescentibus, ad 6 cm. longis et 2 cm. diametro, seminibus 2, inter se leviter constrictis.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 2597, Aug. 28, 1940, in open humid forests, alt. 200 m.

This species is somewhat anomalous in the Annonaceae in its monocarpellate flowers, although occasionally one finds species in various genera with single carpels, and is likewise anomalous within the genus *Desmos* Lour. (*Unona* auctt. non Linn.) not only in this character but also in its sessile depressed-globose, somewhat hairy stigmas, and much thickened fruits which are only slightly constricted between the two seeds. While it seems probable that ultimately it may be desirable to establish a new genus for this rather striking form, in view of the slight amount of material available (a single flower dissected) it seems best to place it in *Desmos* for the present. It is not closely allied to any previously described species in this group.

***Fissistigma villosissimum* sp. nov.**

Frutex ut videtur scandens, ramulis et floribus et subtus foliis densissime molliter villosis; ramis teretibus, vetustioribus subatris, lenticellatis, glabris vel glabrescentibus, ramulis circiter 2 mm. diametro, densissime ferrugineo-vel subcinereo-villosis; foliis coriaceis, oblongis vel oblongo-ellipticis, 10-16 cm. longis, 3.5-6 cm. latis; brevissime subabrupte acute acuminatis basi late rotundatis vel leviter cordatis, supra laevibus, olivaceis, subnitidis, glabris vel junioribus secus costam perspicue ferrugineo-pubescentibus, subtus densissime uniformiter villosis, pilis elongatis, subadpressis, ferrugineis vel badio-ferrugineis; nervis primariis utrinque circiter 20, supra gracilibus, haud impressis, subtus elevatis, perspicuis, rectis vel leviter curvatis, ad



marginem distincte curvatis sed vix anastomosantibus; petiolo 6–10 mm. longo, densissime villoso vel vetustiori glabrescenti; floribus solitariis vel binis, in axillis superioribus, subsessilibus, circiter 2 cm. longis; sepalis liberis vel subliberis, oblongo-ovatis, crasse coriaceis, intus verruculosus, glabris, extus densissime badio-villosis, 10–12 mm. longis, deorsum 7 mm. latis, sursum angustatis, acutis; petalis crasse coriaceis, exterioribus oblongo-ovatis, 2 cm. longis, 1 cm. latis, sursum angustatis, obtusis, intus verruculosus, glabris vel sursum ad marginem cinereo-puberulis, extus densissime longe subadpresso subbadio-villosis, petalis interioribus oblongo-lanceolatis, 1.5 cm. longis et 7 mm. latis, crassissime coriaceis, sursum angustatis, obtusis, extus in partibus medianis adpresso puberulis ceteroquin glabris, intus ad basim excavatis, verruculosus, sursum crassissimis, valvatis; staminibus numerosis, 2–2.4 mm. longis, plus minusve oblanceolatis, cellulis contiguis, connectivo ovoideo, acuto vel obtuso, 0.8–1 mm. longo, quam partibus celluliferis latioribus; carpellis circiter 20, cum stylis 3.5–4 mm. longis, ovario oblongo, densissime adpresso subferrugineo-villoso, pilis 1–2 mm. longis; stylis glabris oblongis, crassis, 1.5 mm. longis, truncatis vel subtruncatis interdum minute denticulatis, stigmatibus haud distinctis, glabris; ovulis circiter 8, 2-seriatis.

INDO-CHINA, Tonkin, Thoi Nguyen Province, Phan Mê, *Pételot* 2683, Nov. 12, 1939.

The alliance of this species is clearly with the Hainan-Tonkin *Fissistigma Maclurei* Merr. (*Melodorum Maclurei* Ast) and **F. villosum** (Ast) comb. nov. (*Melodorum villosum* Ast in Lecomte, Fl. Gén. Indo-Chine Suppl. 1: 110. 1938), the latter based on a single *Poïlane* collection from Blao, Annam. It differs from the former notably in its sessile or nearly sessile flowers, more numerous primary nerves, longer petioles, and shortly acuminate, not obtuse leaves, and from the latter in its larger leaves, much more copious ferrugineous indumentum, and larger flowers, being apparently more closely allied to the latter than to the former.

#### MYRISTICACEAE

##### ***Knema Petelotii* sp. nov.**

Arbor parva, ramis ramulisque teretibus, ramis glabris vel subglabris, ramulis ultimis circiter 1.5 mm. diametro, obscure longitudinaliter striatis, subdense breviter substellato-subfurfuraceis, pallide brunneis; foliis firmiter membranaceis vel chartaceis, oblongis vel oblongo-oblanceolatis, 9–22 cm. longis, 2.5–5.5 cm. latis, distincte acute acuminatis, basi late acutis, supra glabris, in sicco olivaceis, opacis vel subnitidis, nervulis et reticulis ultimis gracilibus sed manifestis, leviter elevatis, subtus glaucis praesertim secus costam nervosque minute substellato-subfurfuraceis glabrescentibus; nervis primariis utrinque 12–18, subtus elevatis, perspicuis, secus marginem arcuato-anastomosantibus; petiolo 5–10 mm. longo, dense breviter subgranuloso-pubescente; inflorescentiis ♂ axillaribus, solitariis, umbellatis, 3–5-floris, pedunculis 3–5 mm. longis, cum pedicellis 5–6 mm. longis dense breviter pallide brunneo-pubescentibus, indumento substellato vel substellato-subfurfuraceo; bracteolis in partibus  $\frac{2}{3}$  vel  $\frac{3}{4}$  superioribus subreniformibus, late rotundatis, circiter 1 mm. longis; perianthio 5–6 mm. longo, inaperto 3–4 mm. diametro, extus dense breviter pubescente, tubo circiter 3 mm. longo, intus glabro, lobis 3, late ovatis, tubo aequantibus, subobtusis vel late acutis, intus glabris; alabastro obovoideo, androphoro

3 mm. longo, glabro, stipite sursum leviter incrassato, apicem cum antheris circiter 2 mm. diametro, convexo; antheris 10, sessilibus, 1 mm. longis.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot 6608*, in open humid forests.

This is clearly distinct from any of the five species admitted by Lecomte as occurring in Indo-China. It is characterized by its relatively thin leaves which are glaucous beneath, its short substellate-subfurfuraceous indumentum on the inflorescences and younger parts, and by its few-flowered, simple staminate umbels. In accordance with Warburg's arrangement of the species it apparently belongs in the group with *Knema Pierrei* Warb. which has much larger, more numerous nerved leaves.

#### HERNANDIACEAE

##### *Illigera Petelotii* sp. nov. § *Appendiculatae* ?

Frutex scandens, plus minusve pubescens, caulibus in sicco subcastaneis, longitudinaliter sulcatis, leviter pubescentibus glabrescentibus, ramulis ultimis teretibus, 1.5–2 mm. diametro, parce pubescentibus; foliis 3-foliolatis, petiolo 7–9 cm. longo, leviter pubescenti, axillis plerumque alabastra ferrugineo-pubescentia gerentibus; foliolis subcoriaceis vel junioribus submembranaceis, ellipticis anguste ovato-ellipticis vel leviter obovato-ellipticis, breviter obtuse acuminatis, basi leviter cordatis, 8–12 cm. longis, 5–7 cm. latis, supra glabris vel ad costam nervosque breviter pubescentibus, in sicco olivaceo-brunneis, subnitidis, subtus paullo pallidioribus, breviter molliterque subconspere pubescentibus, nervis lateralibus utrinque 4, curvato-adscedentibus, arcuato-anastomosantibus, subtus distinctis, elevatis, reticulis primariis gracilibus, distinctis; petiolulis breviter pubescentibus, 1.2–1.5 cm. longis; inflorescentiis terminalibus, laxis, amplis, ad 25 cm. longis, ramis paucis, 10–15 cm. longis, breviter pubescentibus; floribus (ut videtur paucis) ignotis, bracteis oblongo-ellipticis, utrinque pubescentibus, 2–3 mm. longis; fructibus maturis (cum alis) 4–5 cm. latis, 2.5 cm. longis, apice distincte retusis, leviter pubescentibus, late bialatis et inter alas latiores anguste bicarinatis, alis latissime rotundatis, glabris vel subglabris.

INDO-CHINA, Bac Giang Province, between Kep and Pho Vi, *Pételot 2476*, February 27, 1936, borders of the forest.

Although the flowers of this species are as yet unknown, it is suspected that it belongs in Dunn's section *Appendiculatae* because of its general resemblance to *Illigera Pierrei* Gagnep. It differs from Gagnepain's species, of which an isotype is available, in its leaves being softly pubescent beneath, those of *I. Pierrei* Gagnep. being glabrous except for the indumentum in the axils and along the midrib below on the lower surface, the differences in the fruits being even more striking. In *Pierre 1950, 1956* from Baochiang and Mokay, Bienhoa Province, the fruit wings are 3 to 4 cm. long and 2 to 3.5 cm. wide, and elliptic in outline; in *Pételot 2476* they are suborbicular and 2.5 cm. long and wide.

*Illigera mollissima* W. W. Sm. Notes Bot. Gard. Edinb. **10**: 42. 1917.

*Illigera cordata* Dunn, Jour. Linn. Soc. Bot. **38**: 296. 1908, pro minore parte, *quoad Hancock 538* et "foliolis suborbicularibus — ubique molliter pubescentibus."

Dunn's species was based on two different entities, *Hancock 538* clearly

being the same as *Illigera mollissima* W. W. Sm.; the three Henry numbers cited by him are retained as representing *I. cordata* Dunn as apparently Dr. Smith interpreted Dunn's species from the Henry material when he described *Illigera mollissima* W. W. Sm. Any other interpretation would involve the acceptance of *Illigera cordata* Dunn as appertaining to the species with softly pubescent suborbicular leaves, the reduction of *I. mollissima* W. W. Sm. to synonymy, and the description of *Henry 9902, 9902A, 10649* (specimens of all of which are before me) as a new species. *Illigera mollissima* W. W. Sm., as thus interpreted, is represented in the herbarium of the Arnold Arboretum by the following specimens: Szechuan, *Forrest 21403*; Yunnan, *Delavay 3600* and two sheets *s.n.* (distributed as *I. cordata* Dunn), *R. C. Ching 20217*, April 25, 1939.

***Illigera cordata* Dunn**, Jour. Linn. Soc. Bot. **38**: 296. 1908.

To "save" this name, as explained above, and to "save" *Illigera mollissima* W. W. Sm., I restrict Dunn's species to the cited *Henry* specimens, *9902, 9902A, 10649*, referring *Hancock 538* to *Illigera mollissima* W. W. Sm. The species, as thus restricted is further represented by *Maire s.n.* from Yunnan and *Wilson 4091* from "western China." To be eliminated from the original description "foliis suborbicularibus - - - ubique molliter pubescentibus"; the leaflets are ovate to oblong-ovate, acuminate, slightly but distinctly cordate, sparingly short-pubescent becoming subglabrous, and on the three *Henry* specimens examined are but 5 to 8 cm. long. The mature fruits on *Henry 9902* are 2 cm. long and 3 to 3.5 cm. wide (including the wings) and the description of *Illigera cordata* Dunn should thus be changed from "fructus - - - 3-5 cm. latus" to "3-3.5 cm. latus."

***Illigera yaoshanensis* Hao**, Repert. Sp. Nov. **42**: 84. 1937.

This species, described from fruiting specimens from Kwangsi (*Sin 1536, 3536*) and Hainan (*Henry 8564*), should be compared with *Illigera platyandra* Dunn, as it seems, from the description, to be very similar to the latter rather than to *I. mollissima* W. W. Smith, to which it was compared. In the description "petiolis 10-20 mm. longis" must be an error for the petiolules. I think that *Tsang 23288* from Tou Ngok Shan, Kwangsi, near the Kwangtung border, represents Hao's species, and if so, then it would seem to be clear that his species should be reduced to *I. platyandra* Dunn.

#### CAPPARIDACEAE

***Capparis Petelotii* sp. nov.**

Frutex glaber, circiter 2.5 m. altus, inermis (saltem in partibus superioribus), ramis teretibus, ultimis circiter 3 mm. diametro; foliis chartaceis, oblongo-ellipticis, 20-35 cm. longis, 7-12 cm. latis, basi rotundatis vel late acutis, apice apiculato-acuminatis, in sicco pallide viridibus, supra nitidis, subtus paullo pallidioribus; nervis primariis utrinque circiter 12, distantibus, curvatis, subtus valde perspicuis, elevatis, arcuato-anastomosantibus, secundariis reticulisque primariis laxis elevatis perspicuis; petiolo circiter 1.5 cm. longo; floribus supra-axillaribus, plerumque 4, 1-seriatim dispositis, pedicellis glabris, sursum plus minusve incrassatis, ad 1.8 cm. longis; sepalis lanceolatis vel elliptico-lanceolatis, acuminatis, circiter 12 mm. longis et



4 mm. latis, extus glabris, intus minutissime puberulis; petalis late oblanceolatis, circiter 2 cm. longis et 6-7 mm. latis, rotundatis vel obtusis, extus glabris, intus purpureis et deorsum obscure pubescentibus; filamentis glabris, ad 3 cm. longis, filiformibus; antheris oblongis, 2 mm. longis; gynophoro glabro, 3 cm. longo; ovario oblongo-ovoido, glabro, 3 mm. longo, placentis 4, ovulis numerosis; stylo crasso, 1 mm. longo, stigmatibus 1 mm. diametro.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot 2618*, July 2, 1940, a shrub about 2.5 m. high, alt. 600 m.

A species in the group with *C. horrida* Linn. and *C. micracantha* DC., characterized by the flowers being superimposed in a line above the axils, and in this group most closely allied to *Capparis donnaiensis* Pierre, from which it differs in its much larger, thinner leaves, somewhat fewer lateral nerves, larger flowers and nearly glabrous petals and sepals, these being only obscurely and shortly pubescent within, quite glabrous outside.

***Capparis yunnanensis*** Craib & W. W. Sm. Notes Bot. Gard. Edinb. **9**: 91. 1916.

INDO-CHINA, Tonkin, Chapa, *Pételot 5951*, April 1936, a large liana along mountain streams, alt. 1200 m. Yunnan.

When first studied, this was indicated by me as an undescribed species, and although it differs slightly from *Henry 12986*, the type of the species, in its shorter inflorescences, I am now convinced that the Chapa material should be referred to this Yunnan form.

#### SAXIFRAGACEAE

***Hydrangea indochinensis*** sp. nov. § *Euhdrangea*, *Petalanthae*.

Frutex, inflorescentiis exceptis glaber vel subglaber; ramis teretibus, glabris, laevibus, in sicco subatro-viridibus, junioribus brunneis, ultimis circiter 1 mm. diametro; foliis lanceolatis vel oblongo-lanceolatis, 7-11 cm. longis, 2-3 cm. latis, graciliter acuminatis, basi acutis vel cuneatis, submembranaceis, in sicco supra olivaceis, subtus pallidioribus, utrinque glabris vel junioribus subtus obscure conspersissime breviter pubescentibus, margine plerumque revolutis, obscure subcalloso-denticulatis vel deorsum integris, dentibus minutis, 1-3 mm. distantibus; nervis primariis utrinque circiter 7, gracilibus, distinctis, curvato-adscendentibus, circiter ad marginem obscure arcuato-anastomosantibus; petiolo glabro, 1-2 cm. longo; inflorescentiis terminalibus, pedunculatis, breviter, subadpresse substrigosohirsutis, pedunculo circiter 4 cm. longo, ramis primariis pedunculum subaequantibus, subpatulis, sub fructu (sine radiis sterilibus) ad 9 cm. latis, pedicellis 3-5 mm. longis; capsulis ovoideis, circiter 4 mm. longis, additis stylis persistentibus 3-5 (plerumque 4) 2-2.5 mm. longis, extus leviter 8-costatis, subrefractis, glabris vel praesertim deorsum conspersissime subadpresse hirsutis, in vivo ut videtur subazureis; calycis lobis persistentibus 5, oblongis, obtusis, suberectis, 0.5 mm. longis; ovario sub fructu plane infero vel apici leviter protruso; seminibus pallidis, oblongo-ellipsoideis, utrinque subattenuatis, utrinque subacutis vel apice subacuminatis, vix vel obscure alatis, longitudinaliter striatis, circiter 1 mm. longis; radiis sterilibus circiter 5, elongatis, ad 5 cm. longis sub medio saepe flores 1-3 fertiles ferentibus; floribus sterilibus sub fructu 4-meris, albidis, circiter 4 cm. diametro, sepalis suborbiculari-ovatis vel suborbiculari-obovatis, integris,

rotundatis, basi late acutis, chartaceis vel submembranaceis, 1.5–2 cm. longis, 1.2–1.8 cm. latis, subperspiciue longitudinaliter 7-costatis, reticulatis, utrinque, praesertim deorsum, secus nervos conspersissime breviter hirsutis.

INDO-CHINA, Tonkin, Chapa, Massif de Fan Tsi Pan, *Pételot* 2687, July 1940, in humid ravines, alt. 2200 m.

This is the second species of the genus to be recorded from Indo-China. It is characterized by its thin leaves, by being entirely glabrous except the inflorescences, by its inferior ovaries, apparently somewhat nodding capsules, and greatly elongated sterile rays, each bearing a single sterile flower, and about half way along the peduncle 1 to 3 fertile flowers. In spite of its distinctly superior ovaries, it clearly belongs in the group with *Hydrangea chinensis* Maxim., and its closest described ally may be *Hydrangea kwangsiensis* Hu, Jour. Arnold Arb. **12**: 152. 1931, Ic. Pl. Sin. **3**: 35. t. 135. 1933.

#### ROSACEAE

##### **Pygeum affine** sp. nov. § *Cylopygeum*.

Species *P. ciliato* Koehne simillima et affinis, differt foliis tenuioribus, glandulis basalibus nullis vel, si praesentibus, planis, obscurissimis, nullo modo marsupialibus, nervis reticulisque supra haud impressis, antheris vix 0.5 mm. longis. Arbor circiter 12 m. alta, ramis teretibus, subatris, consperse lenticellatis, glabris vel junioribus decidue subferrugineo-pubescentibus, ramulis ultimis dense subferrugineo-villosis, circiter 1.5 mm. diametro; foliis chartaceis, ellipticis vel late oblongo-ellipticis, 11–16 cm. longis, 5–7.5 cm. latis, breviter subobtusae acuminatis, basi plerumque rotundatis, in sicco brunneis vel pallide olivaceo-brunneis, subtus pallidioribus, supra ad costam nervosque subferrugineo-pubescentibus, ceteroquin glabris vel in parenchymate pilos paucos breves conspersissimos ferentibus, subtus ad costam nervosque sat conspicue breviter ferrugineo-pubescentibus, in parenchymate conspersissime pubescentibus glabrescentibus, margine planis vel minute revolutis si revolutis minute multiserialiter breviter ciliatis; nervis primariis utrinque 8–9, supra planis, subtus elevatis, perspicuis, arcuato-anastomosantibus, reticulis primariis gracilibus, distinctis, leviter elevatis; petiolo dense ferrugineo-pubescenti, 6–10 mm. longo; stipulis caducis (haud visis); inflorescentiis dense ferrugineo-pubescentibus, racemis 3–5-fasciculatis, vel rariter paniculatis, 4–6 cm. longis, plerumque in axillis defoliatis in ramis annotinis; pedicellis 1.5–3 mm. longis, bracteo-  
lis oblanceolatis, 1.5 mm. longis, extus dense pubescentibus, intus glabris, caducis; calycibus subcupulatis, extus ferrugineo-pubescentibus, intus, basi exceptis, glabris, deorsum plus minusve angustatis, 3 mm. longis, segmentis 10, 5 (sepalis), triangulari-ovatis, acutis, pubescentibus, 1 mm. longis, 5 alternis (petalis) aequilongis, anguste obovatis, obtusis vel rotundatis; staminibus circiter 30, filamentis glabris, 1.5–3 mm. longis; antheris 0.5 mm. longis; ovario ovoideo, circiter 1.2 mm. longo, deorsum ferrugineo-villoso, sursum pilos sparsos ferente; stylis 2.5–3 mm. longis; fructibus ignotis.

INDO-CHINA, Tonkin, Chapa, *Pételot* 6160 (TYPE), 6161, August 1930 and August 1935, in forests, alt. about 1500 m.

The alliance of this species is clear, but Koehne's sections are in part based on very slight characters. The only other described species, *Pygeum ciliatum* Koehne, to which this might be closely allied is *Pygeum arboreum*

"Kurz" (accredited by Kurz to Endlicher), but as Koehne notes, this specific name cannot be retained as it was based on *Polydontia arborea* Blume (see Jour. As. Soc. Bengal **45**(2): 303. 1876) and Blume's species was based on a mixture, including *Pygeum latifolium* Miq., *P. griseum* Blume, *P. parviflorum* Teysm. & Binn., and *P. Blumei* Koehne, as interpreted by Koehne. In *Pygeum affine* Merr. the basal glands are usually absent, or if present, then a single one, and this obscure and plane, not at all saccate. The inflorescences are mostly racemes, but occasionally there are one or two lateral branches as much as 2.5 cm. long.

**Pygeum brachybotrys** sp. nov. § *Cylopygeum* ?

Arbor, ramis teretibus, in sicco nigris, glabris, conspersissime lenticellatis, ramulis junioribus circiter 1.5 mm. diametro, dense breviter ferrugineo-pubescentibus; foliis chartaceo-coriaceis, oblongo-ovatis, integris, 5-7 cm. longis, 3-3.5 cm. latis, breviter acute acuminatis, basi late acutis vel subrotundatis, margine obscurissime revolutis, breviter ciliatis, supra olivaceis, glabris, nitidis vel junioribus opacis et praesertim secus costam plus minusve pubescentibus, subtus brunneis, uniformiter subadpresse breviter villosis, glandulis basalibus nullis, vel cum adsint singularibus subtus tantum manifestis, subconcavis haud saccatis, circiter 1 mm. diametro; nervis primariis utrinque 7. supra (in foliis vetustioribus) cum reticulis leviter impressis, subtus elevatis, perspicuis, curvato-adscendentibus, haud vel secus marginem obscurissime arcuato-anastomosantibus; petiolo 5-7 mm. longo, breviter villosa vel vetustis glabra; stipulis caducis (haud visis); inflorescentiis brevibus, ferrugineo-villosis, 1-2 cm. longis, racemis 3-5-fasciculatis, in axillis defoliatis (in ramis annotinis) rarer in axillis foliorum, bracteolis non visis; floribus breviter (1-1.5 mm.) pedicellatis vel alabastris sessilibus vel subsessilibus; calycis tubo cupulato, 2 mm. longo, extus subferrugineo-pubescenti, segmentis 10, omnibus simillimis, 0.5-0.8 mm. longis, pubescentibus, obtusis vel subacutis; staminibus circiter 20, filamentis glabris, 1-2.5 mm. longis; antheris vix 0.5 mm. longis; ovario glaberrimo, oblongo-ovoideo, circiter 1 mm. longo; stylis glabris, 1.3-2 mm. longis; fructibus ignotis.

INDO-CHINA, Tonkin, Xoan Dao, Pho Ba Che, *Pételot 4029* (TYPE).

A species characterized by its small leaves, the basal glands normally absent, but if present, then a single one clearly evident on the lower surface and slightly concave but not at all saccate, and its unusually short inflorescences and small flowers. While I have tentatively placed it in the section *Cylopygeum* I am by no means convinced that it belongs here, but in the absence of fruits nothing further can be done with it at present. With the description of these two new species the total number of Indo-China species is now five.

#### LEGUMINOSAE

**Apios carnea** (Wall.) Benth. ex Baker in Hook. f. Fl. Brit. Ind. **2**: 188. 1876; Gagnepain in Lecomte, Fl. Gén. Indo-Chine **2**: 421. f. 40, 6-8. 1916; Hand.-Maz. Symb. Sin. **7**: 579. 1933; Chun, Sunyatsenia **4**: 217. 1940.

*Cyrtotropis carnea* Wall. Pl. As. Rar. **1**: 50. t. 62. 1830.

INDO-CHINA, Tonkin, Chapa, *Pételot 2470*, Aug. 1940, a large liana, alt. 1500 m. India to Siam, Yunnan, and fide Chun, in Kwangtung.



The only reason for recording this here is that although Gagnepain described it, *l.c.*, he had seen no Indo-Chinese specimens, admitting the species because it occurs in Siam. The Chinese *Apios macrantha* Oliv. Hook. Ic. **20**: *t.* 1946, 1890, originally described from Szechuan, is allied but is apparently distinct.

**Desmodium triangulare** (Retz.) comb. nov.

*Hedysarum triangulare* Retz. Obs. **3**: 40. 1783.

*Hedysarum cephalotes* Roxb. Hort. Beng. 57. 1814, *nomen nudum*, Fl. Ind. ed. 2, **3**: 360. 1832.

*Desmodium cephalotes* Loud. Hort. Brit. 310. 1830, *nomen nudum*, Wall. List no. 5721. 1832; Gagnep. in Lecomte, Fl. Gén. Indo-Chine **2**: 573. 1920.

*Dendrolobium triangulare* Schindl. Repert. Sp. Nov. **20**: 279. 1824.

Retzius' specific name is the oldest one for this widely distributed Asiatic species, whether it be retained in *Desmodium* or placed in the generic segregate *Dendrolobium* where Schindler disposes of it.

**Bauhinia bracteata** Grah. ex Baker in Hook. f. Fl. Brit. Ind. **2**: 282. 1878; Craib, Fl. Siam. Enum. **1**: 517. 1928; Gagnep. in Lecomte, Fl. Gén. Indo-Chine **2**: 149. 1913.

*Bauhinia unguiculata* Baker, op. cit. 277; Gagnep. op. cit. 150.

*Bauhinia Harmandiana* Pierre ex Gagnep. Not. Syst. **2**: 172, 1912; Lecomte, Fl. Gén. Indo-Chine **2**: 128. 1913.

Craib's investigation of the confusion that has existed in reference to the status of *Bauhinia bracteata* Grah., *B. Helferi* Craib, and *B. unguiculata* Baker results in the reduction of the Indo-Chinese list of *Bauhinia* by two species; see his note, Kew Bull. **1924**: 93. 1924, sub *B. Helferi* Craib, *in nota*. Siam and Indo-China.

**Bauhinia coccinea** (Lour.) DC. Prodr. **2**: 516. 1825; Merr. Trans. Am. Philos. Soc. II. **24**(2): 188. 1935.

*Phanera coccinea* Lour. Fl. Cochinch. 37. 1790, ed. 2, 47. 1793; Moore, Jour. Bot. **63**: 247. 1925.

INDO-CHINA, Annam, Mount Bana, *Clemens 4254*, May-July 1927, a great liana covering the highest trees with a mass of unusually large brilliant red flowers.

This is a most remarkable species with unusually large flowers, about 13 cm. in diameter, entirely different from any of the forms admitted by Gagnepain, but an Indo-Chinese species overlooked by him, falling in his section I (ovaries pubescent, *not glabrous*). The conspicuous lateral appendages to the claws of the standard are more or less lacerate and up to 1 cm. long along the upper  $\frac{1}{2}$  to  $\frac{2}{3}$  of the claw. The long stipitate ovaries and the styles are densely appressed pubescent with short, shining brownish-red hairs. The sepals are linear-lanceolate or narrowly strap shaped, 3-3.5 cm. long, 3 mm. wide, sharply acute or slightly acuminate, appressed pubescent outside. The calyx tube, in bud, is 1.5 cm. long. 2-3 mm. wide, slightly sulcate, pubescent, the bud excluding the tube, cylindric, 3 cm. long, about 8 mm. in diameter. This most striking species is the type of the subgenus *Phanera* and is at present known only from the original collection made in the latter part of the eighteenth century and the Clemens collection of 1927.

**Bauhinia tenuiflora** Watt ex C. B. Clarke, Jour. Linn. Soc. Bot. **25**: 18. *t.* 6. 1889.

*Bauhinia caterviflora* Chen, Jour. Arnold Arb. **19**: 129. 1938, Lingnan Sci. Jour. **18**: 479. 1939; Merr. Jour. Arnold Arb. **21**: 368. 1940.

Chen's species was credited to Indo-China in 1940 on the basis of *Pételot 2165* from Chapa, but it has since transpired that *B. caterviiflora* Chen is identical with the much older *B. tenuiflora* Watt, originally described from Munnepore. The species extends from Burma to Siam, northern Indo-China, and Yunnan.

***Bauhinia carcinophylla* sp. nov. § *Phanera*.**

Frutex scandens, ramulis petiolis inflorescentiis et foliis subtus perspicue subadpresse castaneo- vel rubiginoso-subferrugineo-pubescentibus, vel in foliis vetustioribus indumento pallide cinereis, ramis teretibus, laevibus, glabris, ramulis ultimis circiter 2 mm. diametro, dense subadpresse villosis; foliis fere ad basim fissis vel lobis tota liberis, coriaceis, basi distincte cordatis, 10-12-nerviis, supra glabris, olivaceis vel atro-olivaceis, minute subdense reticulatis, subtus uniformiter breviter subadpresse pubescentibus, lobis vel foliolis 6-10 cm. longis, 2.5-4 cm. latis, omnino liberis vel deorsum breviter (2-6 mm.) connatis, inaequilateraliter oblongis, fere semilunaribus, obtuse acuminatis, falcatis, leviter incurvatis, apices saepe attingentibus vel imbricatis; petiolo 1.5-5 cm. longo, dense villoso; inflorescentiis terminalibus, dense subrubiginoso-villosis, brevibus, simpliciter racemosis, haud corymbosis, 6-8 cm. longis, ad 5-6 cm. latis, axibus abbreviatis (2-5 cm. longis), floribus plus minusve confertis; pedicellis 1-1.5 cm. longis, bracteis lanceolatis, acuminatis, 5 mm. longis, bracteolis ad basim calycis tubi linearibus, 4-5 mm. longis, deciduis; calycis tubo cylindraceo, circiter 6 mm. longo, 3.5 mm. diametro, basi acuto, cum lobis extus dense adpresse subrubiginoso-villoso, lobis 5, reflexis, oblongis vel oblongo-ellipticis, acuminatis, intus glabris, circiter 1 cm. longis et 4 mm. latis; petalis vix unguiculatis sed deorsum angustatis, obovatis vel oblongo-obovatis, rotundatis, basi acutis, intus glabris, extus dense adpresse subrubiginoso- vel ferrugineo-villosis, ad 1.8 cm. longis et 1 cm. latis; staminibus fertilibus 3, filamentis sursum glabris, deorsum villosis, circiter 12 mm. longis; antheris oblongis, 5 mm. longis; ovario oblanceolato, circiter 8 cm. longo, dense ferrugineo-villoso, stylo ad 15 mm. longo, deorsum plus minusve subadpresse villoso supra medium glabro; leguminibus (valde immaturis) dense villosis.

INDO-CHINA, Tonkin, Tsai Wong Mo Shan and Sai Wong Mo Shan (Sai Vong Mo Leng), in the extreme northeastern part of Indo-China just south of the juncture of the Kwangtung-Kwangsi-Tonkin boundaries, *W. T. Tsang 29033* (TYPE), 29878, May 11-20, 1939, and May-Dec. 1940, in thickets, flowers white, fragrant.

This is a remarkably distinct species, falling in Gagnepain's section I (ovaries pubescent, *not glabrous*, as indicated by him in his key), but differing from all of the 21 species placed by him in this group by the leaves being divided almost or quite to the base, the sinuses normally very narrow, the somewhat incurved apical parts of the lobes or leaflets often touching or overlapping, somewhat suggesting the claws of a crab. The short, crowded, simple racemes are also characteristic, for most of the species in this group have corymbose inflorescences. The apical parts of the buds are ellipsoid and about 1 cm. long, exceeding the calyx tubes in length.

***Bauhinia Clemensiorum* sp. nov. § *Phanera*.**

Frutex scandens, ramulis inflorescentiis et petiolis et foliis subtus insigniter rubiginoso-villosis, ramis vetustioribus glabrescentibus; foliis subcoriaceis, integris, breviter petiolatis, ovatis, 5-7 cm. longis, 3.5-7.5 cm. latis,

basi late rotundatis vel leviter cordatis, 9-nerviis, apice late rotundatis plerumque brevissime apiculatis, supra in sicco subcastaneo-olivaceis, par-cissime villosis glabrescentibus, subtus rubiginosis atque perspicue rubi-ginoso-villosis, nervis elevatis, distinctis; petiolo dense rubiginoso-villoso, 8–10 mm. longo; cirrhis circiter 5 cm. longis, dense rubiginoso-villosis; in-florescentiis stricte racemosis, racemis solitariis vel binis, 6–10 cm. longis, dense rubiginoso-villosis, breviter pedunculatis, pedicellis post anthesin persistentibus numerosissimis, confertis, 1.2–1.5 cm. longis, sub fructu plerumque deciduis, rhachibus nunc cicatrices ca. 3 mm. diametro elevatas perspicuas ferentibus; bracteis lineari-filiformibus, 6–8 mm. longis, pedi-cellis binis bracteolas simillimas supra medium ferentibus; calycis tubo cylindrico vel subcompresso circiter 2 cm. longo, 1.5–2 mm. lato, dense adpresse pubescenti; calycis lobis 5, liberis, reflexis, oblongo-lanceolatis, acuminatis, 7 mm. longis, 3 mm. latis, intus glabris, extus dense rubiginoso-pubescentibus; petalis suborbicularibus, roseis, utrinque late rotundatis vel apice plus minusve retusis, haud unguiculatis, intus glabris, extus praesertim in partibus medianis parce rubiginoso-villosis, pilis adpressis; staminibus fertilibus 3; antheris oblongo-ellipsoideis, 3 mm. longis; staminodeis 7, gla-bris, 2.5–3 mm. longis; ovario glabro, in alabastro sessili demum distincte stipitato; fructibus glaberrimis, planis, castaneis, nitidis, glabris, leviter reticulatis, rectis vel leviter curvatis, loriformibus, 4–4.5 cm. latis, 20 cm. longis, pedicellis cum stipitibus 5 cm. longis.

INDO-CHINA, Annam, general vicinity of Hué and of Tourane, *J. & M. S. Clemens* 3621 (TYPE), 3229, July 3 (flower) Aug. 3 (fruit) 1927, a luxuriant vine along forest margins, flowers pink-red.

A remarkably distinct species, falling in Gagnepain's group II (ovaries *glabrous*, not pubescent, in this group), but entirely different from the other species in this assemblage. Striking characters, other than its rubiginous indumentum, are its entire, not lobed leaves, short petioles, dense racemes, the few racemes not arranged in panicles, the pedicels persisting for a time after the flowers fall, but when the fruits are mature nearly all the pedicels have fallen, leaving very prominent projecting scars on the somewhat thick-ened rachis.

**Bauhinia melanophylla** sp. nov. § *Phanera*.

Frutex scandens, ut videtur altus, ramis glabris, teretibus, in sicco atris, junioribus parciissime pubescentibus glabrescentibus; foliis membranaceo-chartaceis, in sicco atris, utrinque nitidis, in ambitu suborbicularibus, 7–12 cm. longis latisque, basi perspicue cordatis, 11-nerviis, lobis late rotundatis, apice breviter lobatis, lobis 2–2.5 cm. longis e basi latissimis sursum angus-tatis, acute acuminatis, supra glabris, subtus ad basim parce adpresse cilia-tis glabrescentibus; petiolo 3.5–5 cm. longo, parciissime adpresse-hirsuto glabrescenti; inflorescentiis terminalibus racemis circiter 6 elongatis pe-dunculatis paniculam formantibus, pedunculis 7–9 cm. longis, glabris vel glabrescentibus, cirrhis ad 10 cm. longis, partibus floriferis 10–20 cm. longis, subdense adpresse sordide cinereo-pubescentibus, pedicellis circiter 1 cm. longis, dense adpresse pubescentibus, vel superioribus (alabastris) breviori-bus, bracteis lanceolatis, acuminatis, 3–4 mm. longis, bracteolis vix 1 mm. longis; floribus sub anthesin 3–3.5 cm. diametro, alabastris obovoideis, late rotundatis, dense, breviter, sordide adpresse-pubescentibus; calycibus in-



aequilateralibus, subfalcatis, tubo extus dense breviter pubescenti, obscure sulcato, basi acuto, 5–7 cm. longo, sursum circiter 5 mm. diametro, limbo sub anthesin patulo vel subpatulo, 1 cm. diametro, lobis 5, plus minusve inaequalibus, lobis late ovatis, apice rotundatis, intus glabris, 2.3–3 mm. longis et 3.5–4 mm. latis; petalis unguiculatis, utrinque sordide breviter cinereo-pubescentibus, limbis ellipticis vel obovatis, late rotundatis, basi acutis vel late acutis, 10–11 cm. longis, 7–9 mm. latis, unguiculis 3–6 mm. longis et 1–2 mm. latis; staminibus fertilibus 3, filamentis glabris, 1.5–2 cm. longis, staminodeis plerumque 6, plus minusve connatis, glabris, 3–4 lanceolatis e basi leviter incrassatis, 2–3 majoribus, e basi valde incrassatis ovoideis vel obovoideis, interdum inaequilateralibus, apice abrupte contractis, filamenta sterilia ad 2 mm. longa ferentibus; ovario breviter unguiculato, anguste oblongo, densissime pubescente, sub anthesin 1 cm. longo et 3 mm. lato, stylis glabris, ovarium aequantibus.

INDO-CHINA, Tonkin, Hoa Binh Province, Muong Thon, route from Hanoi to Hoa Binh, *Pételot* 2664, April 21, 1940, along small streams.

This species is strongly characterized by its elongated racemes forming a terminal panicle, the younger parts of the inflorescences densely and shortly subcinereous-pubescent, the older parts glabrous or nearly so, the inequilateral, somewhat falcate calyx-tubes, the petals densely pubescent on both surfaces, the peculiar staminodes, several with greatly thickened bases and all more or less connate, and the rather thin shortly-lobed, in general orbicular, cordate leaves which are glabrous, black and shining on both surfaces when dry. It falls in Gagnepain's group I (with pubescent, *not glabrous*, ovaries), but is not closely allied to any of the twenty-one species placed by him in this assemblage.

#### MELIACEAE

##### *Dysoxylum Gobara* (Ham.) comb. nov.

*Guarea Gobara* Ham. Trans. Wern. Soc. **6**: 306. 1. f. 1832.

*Guarea procera* Wall. List no. 1261. 1829, *nomen nudum*.

*Dysoxylum procerum* Hiern in Hook. f. Fl. Brit. Ind. **1**: 547. 1875; C. DC. Monog.

Phan. **1**: 486. 1878; Pellegr. in Lecomte, Fl. Gén. Indo-Chine **1**: 744. f. 81, 6–11. 1911, excl. syn. Blume.

*Guarea disyphonia* Griff. Not. **4**: 503. 1854, Ic. **4**: t. 585, f. 1. 1854.

*Hartighsea Gobara* Wight & Arn. ex Voigt, Hort. Suburb. Calcut. 136. 1845, *nomen nudum*.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 6581, 6603, Oct. and Nov. 1940, in open forests, alt. 700–800 m. Assam and Khasia to Thailand, Burma, and Yunnan.

Craib has already noted, Fl. Siam. Enum. **1**: 252. 1926, that if *D. procerum* Hiern is really the same as *Guarea Gobara* Ham. the specific name should be changed. After an examination of Hamilton's description and his figure of the fruit, I see no reason to consider that he had other than the species long known as *Dysoxylum procerum* Hiern. Although C. de Candolle gives the range of the species to Java (var. *integrum*), I am convinced, after examining an actual specimen of *Dysoxylum excelsum* Blume, named by Blume, that Pitard erred in citing de Candolle's variety as a synonym of *D. procerum* Hiern. Craib notes that *D. turbinatum* King of the Malay Peninsula is a very closely allied species.

## BUXACEAE

**Buxus pubifolia** sp. nov.

Frutex circiter 5.2 m. altus, ramulis petiolis et foliis subtus, praesertim secus costam, breviter molliterque pubescentibus, ramis glabris, teretibus vel obscure sulcatis, subpallidis, ramulis ultimis 1–1.2 mm. diametro, teretibus vel sulcatis; foliis brevissime petiolatis, subchartaceis, ellipticis vel oblongo-ellipticis, 6–10 cm. longis, 2.5–5 cm. latis, acutis, basi late acutis, supra glabris, in sicco subolivaceis, opacis vel leviter nitidis, subtus pallidioribus, nervis primariis 3–5 mm. distantibus, utrinque circiter 17, gracilibus, utrinque leviter elevatis, haud perspicuis; petiolo pubescenti, crasso, 1–1.5 mm. longo; inflorescentiis ♂ axillaribus terminalibusque, subsessilibus, subglomeratis, densis, circiter 6 mm. longis, rhachibus dense pubescentibus paullo productis, bracteis ovatis, acute acuminatis, glabris vel subglabris, 1.5–2 mm. longis; pedicellis ad 1 mm. longis, leviter pubescentibus; floribus masculis confertis, 4-meris, sepalis binis exterioribus obscure carinatis, quam interioribus paullo minoribus, interioribus late elliptico-ovatis vel suborbiculari-ovatis, late rotundatis, leviter cucullatis, glabris, circiter 1.5 mm. longis et 1.3 mm. latis; filamentis glabris, 2–3 mm. longis, pistilloidiis subtruncatis, circiter 1.2 mm. diametro, irregulariter sulcatis; floribus ♀ fructibusque ignotis.

INDO-CHINA, Annam, Province of Quang Binh, My Duc, *Pételot* 6017, July 1930, a shrub 5.2 m. high, in open forests at the base of calcareous formations.

A species characterized by its medium sized, relatively thin leaves, which are densely and softly short-pubescent beneath especially along the mid-ribs, the same type of indumentum being present on the slender branchlets and on the short petioles. The staminate inflorescences are reduced to dense glomerules about 6 mm. in diameter.

## CELASTRACEAE

**Microtropis rhynchocarpa** sp. nov. § *Ramiflorae*.

Frutex glaber, ramis teretibus, ramulis ultimis (novellis) circiter 2 mm. diametro, brunneis, sursum plus minusve compressis canaliculatisque; foliis oblongo-ellipticis vel anguste oblongo-obovatis, 15–20 cm. longis, 5–8 cm. latis, chartaceis, in sicco laevibus, haud verruculosus, supra subolivaceis, subtus brunneis, deorsum angustatis, basi acutis, apice subabrupte breviter (1 cm.) obtuse acuminatis; nervis primariis utrinque 7–9, subadscendentibus, distantibus, subtus elevatis, gracilibus sed perspicuis, laxae arcuato-anastomosantibus, reticulis primariis secundariisque laxis, vix perspicuis; petiolo 1 cm. longo; floribus ignotis; fructibus in ramis vetustioribus in axillis defoliatis fasciculatis; sepalis persistentibus 5, late ovatis, subacutis, circiter 2 mm. longis; fructibus anguste ovoideis, cum rostro 2 cm. longis, 8–9 mm. diametro, extus brunneo-maculatis haud furfuraceis, sursum angustatis, subabrupte conspicue rostratis, rostris deorsum ad 2 mm. sursum circiter 1 mm. crassis, 7–8 mm. longis; pedicellis incrassatis, 2–3 mm. longis, rugosis.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 6607, Nov. 1, 1940, in open humid forests, altitude about 150 m.

A species characterized by its fairly ample, acuminate, slenderly but distinctly nerved, rather thin leaves, and especially by its fascicled prominently rostrate fruits which are borne in the axils of fallen leaves on the

older leafless branches. It is not closely allied to any of the species placed in the series *Ramiflorae* by myself and Miss Freeman, in our treatment of the known species of the genus, Proc. Am. Acad. Sci. Arts **73**: 271-310. 1940 (Mem. Gray Herb. **5**: 271-310).

#### ICACINACEAE

**Gomphandra Chingiana** (Hand.-Maz.) Sleumer, Notizbl. Bot. Gart. Berlin **15**: 238. 1940.

*Stemonurus Chingianus* Hand.-Maz. Sinensia **2**: 3. 1931; Hu, Ic. Pl. Sin. **3**: 44. t. 144. 1933.

INDO-CHINA, Tonkin, Chapa, *Pételot* 5450, 6360, April 1935 and April 1938, in open forests, alt. about 1500 m.

When first studied, this material was placed with *Gomphandra oppositifolia* Pierre, where it cannot possibly belong, and later with *G. hainanensis* Merr. The specimens seem clearly to represent Handel-Mazzetti's species, the type of which was from Kwangsi. *Ching* 8262 from Seh-feng Dar Shan, south of Nanning, Kweichow, distributed as *Schoepfia chinensis* Gardn. & Champ., is a fruiting specimen of this species, the fruits being up to 2 cm. in length and 8 mm. in diameter, oblong-ellipsoid, or sometimes slightly narrowed below. I suspect that certain Yunnan specimens should be referred to this species, including *Henry* 10492 (in fruit) and *Tsai* 55405, 60577, 60583, 61669, 62138. Handel-Mazzetti's species is allied to *Gomphandra hainanensis* Merr., but is apparently distinct.

**Gomphandra mollis** sp. nov.

Frutex vel arbor parva, foliis subtus dense breviter molliterque pubescentibus; ramis ramulisque teretibus, breviter pubescentibus, ramulis ultimis 1.5-2 mm. diametro; foliis oblongis, chartaceis vel junioribus submembranaceis, 13-20 cm. longis, 4.5-6.5 cm. latis, perspicue subabrupteque acuminatis, acuminibus acutis vel subobtusis, ad 1.5 cm. longis, basi late acutis vel subrotundatis, supra in sicco subatris vel atro-olivaceis, subnitidis, glabris vel junioribus ad costam impressam obscure breviter pubescentibus, subtus paullo pallidioribus, dense breviter molliterque pubescentibus; nervis primariis utrinque 8-10, supra haud perspicuis, subtus elevatis, distinctis, subadscendentibus, circiter ad marginem obscure vel haud arcuato-anastomosantibus, reticulis primariis laxis, inconspicuis; petiolo 10-12 mm. longo, dense breviter pubescenti; inflorescentiis oppositifoliis, pedunculatis, 4-5 cm. longis (pedunculo 1.5-2 cm. longo), breviter pubescentibus, ramis primariis plerumque 4, pedunculum terminantibus, subverticillatim dispositis, 1-1.5 cm. longis; floribus numerosis in ramulis ultimis subcapitatim dispositis, plus minusve confertis; floribus ♂ 5-meris, 4.5-5 mm. longis, brevissime pedicellatis vel subsessilibus; calycibus late cupulatis, circiter 1 mm. diametro, vix 0.5 mm. altis, truncatis vel obscurissime 5-denticulatis, margine obscure ciliatis; calycis tubo 3 mm. longo, glabro, lobis ovatis vel ovato-lanceolatis, 1-1.5 mm. longis, acuminatis, acuminibus inflexis; filamentis 4-5 mm. longis, planis, sursum circiter 1 mm. latis, deorsum angustatis, in partibus inferioribus ( $\frac{1}{2}$ - $\frac{2}{3}$ ) glabris, supra intus barbatis, pilis flaccidis, pellucidis, 1-1.5 mm. longis, apicibus leviter subclavatis; antheris ellipsoideis, 0.7-1 mm. longis; ovarii rudimento glabro, subconico, circiter 1 mm. longo.



INDO-CHINA, Tonkin, Sontoy Province, Da Chong, *Pételot* 2658, 7949 (TYPE), May 7, 1936 and May 4, 1940. CHINA, Yunnan, Ping-pien Hsien, *Tsai* 60361, June 20, 1934, in ravines, altitude about 1100 m.

*Gomphandra mollis* Merr. is well characterized by its indumentum and its subcapitately arranged flowers on the four radiating branches of the leaf-opposed inflorescence. When first examined the material was referred to *Gomphandra oppositifolia* Pierre (*Stemonurus oppositifolius* Howard, Jour. Arnold Arb. **21**: 469. 1940), where it certainly does not belong. Pierre's type, a fruiting specimen, the flowers still unknown, was from Bien-hoa, near Saigon, in southern Indo-China.

***Gomphandra Petelotii* sp. nov.**

Arbor circiter 8 m. alta, glabra, vel partibus novellis inflorescentiisque plus minusve breviter pubescentibus, ramis teretibus, glabris, ramulis ultimis circiter 1 mm. diametro; foliis oblongis, oblongo-ellipticis vel late oblongo-lanceolatis, subchartaceis, in sicco atris, subtus paullo pallidioribus, 5-9 cm. longis, 2-3 cm. latis, breviter subobtuse acuminatis, basi late acutis vel subrotundatis; nervis primariis utrinque circiter 6, supra obscuris vel obsoletis, subtus haud perspicuis, circiter ad marginem obscure arcuato-anastomosantibus, reticulis obsoletis; petiolo 5-7 mm. longo, glabro; inflorescentiis terminalibus et in axillis superioribus, subcymosis, obscure pubescentibus glabrescentibus, 1.5-2 cm. longis, ad 2 cm. latis, pedunculatis, pedunculo 5-8 mm. longo, apice subradiatim 4-ramoso, ramis pedunculum subaequantibus, patulis, floribus in ramulis ultimis paucis, subcymosim dispositis, subsessilibus vel breviter pedicellatis, pedicellis 1-2 mm. longis; floribus ♂ 4-5-meris, 3.5-4 mm. longis, glabris; calycibus late cupulatis, circiter 1 mm. diametro, 0.5-0.7 mm. altis, obscure 4-5-denticulatis; corollae tubo 2.5 mm. longo, lobis 4-5, ovatis, circiter 1.5 mm. longis, graciliter acuminatis, acuminibus inflexis; staminibus plerumque 5, filamentis planis, circiter 3 mm. longis, sursum 0.5 mm. latis, deorsum angustatis, infra medio glabris, supra medio intus barbatis, pilis pellucidis, flaccidis, apicibus plus minusve clavatis, superioribus antheros excedentibus; antheris ellipsoideis, 0.8 mm. longis; ovarii rudimento glabro, subconico, acuto, 1 mm. longo, floribus ♀ fructibusque ignotis.

INDO-CHINA, Sontoy Province, Mount Bavi, *Pételot* 2647, May 18, 1940, in open forests, alt. about 500 m.

A species characterized by its short, radiately 4-branched, terminal and axillary inflorescences and its relatively small obscurely nerved leaves, the reticulations obsolete or subobsolete, the few flowers cymosely disposed on the ultimate branches of the inflorescence. Its general alliance is with the Chinese *Gomphandra Chingiana* (Hand.-Maz.) Sleumer.

In retaining *Gomphandra* Wallich as a valid genus distinct from *Stemonurus* Blume, I follow Koorders & Valeton, Bijdr. Boomsoort. Java **5**: 144-151. 1900 (Meded. Lands Plant. **23**: 144-151). In describing the genus, Blume, Bijdr. 643. 1825, included four species, *S. pauciflorus* Bl., *S. secundiflorus* Bl. and *S. javanicus* Bl. which he placed in his section one (unnamed), and *S. frutescens* Bl. which he placed in his section *Anacolosa*. He indicated no type. *Stemonurus frutescens* Bl. is eliminated from consideration, as in Mus. Bot. Lugd.-Bat. **1**: 250-251. 1850 he raised this section to generic rank, the type being *Anacolosa frutescens* (Blume) Blume.

Engler, Nat. Pflanzenfam. **3**(5): 247. 1893, retained *Stemonurus* Blume as a valid genus with *Gomphandra* Wall. and *Medusanthera* Seem. as synonyms, but indicated no type of Blume's genus; at the same time he placed *Stemonurus* in part (as to *S. secundiflorus* Blume) as a synonym of *Urandra* Thwaites. It should be noted that when Blume again considered his genus *Stemonurus*, Mus. Bot. Lugd.-Bat. **1**: 249-250. 1850, he somewhat amplified his generic description, and in this amplification he very definitely includes specific characters of *Stemonurus secundiflorus* Blume, yet for some unexplained reason he did not include this species in his text, although it is the only representative of the group that he figured, op. cit. f. 45. It might be argued that Blume intended to restrict his genus *Stemonurus* to its *Gomphandra* characters; yet even here he indicated no type for his genus, and we still have three of the original species from which to select the type. The international code provides that any author treating a genus may designate the type species, and this Koorders and Valeton very definitely did in 1900 thus: "Genus *Stemonurus* Bl. cuius species typica *S. secundiflorus* a Blume in Tab. XLV Mus. Bot. optime delineata est, species alias nonnullas generice diversas et ad *Gomphandram* Wall. referendas includit. Hoc autem jam a Beccari et Valeton bene demonstrandum est et nullam habet rationem. (ut fecit Engler in Nat. Pfl.) nomen *Stemonurus* pro *Gomphandra* et *Urandra* Thw. (jam ab auctore ipso demissum, Thw. enum.) in *Stemonuri* locum substituere." Even earlier than this Beccari, *Malesia* **1**: 111-116. 1877 had restricted *Stemonurus* Blume to that group of species having the general characters of *Stemonurus secundiflorus* Blume, among Blume's species considering and describing only this one, but adding several others; he thus eliminated all of the other species placed by Blume under *Stemonurus* and this very elimination leaves *S. secundiflorus* Blume as the type of the genus. Valeton, Crit. Overzicht Olac. 234-237. 1886, followed Beccari's interpretation. Sleumer, Notizbl. Bot. Gart. Berlin **15**: 238. 1940, in transferring *Stemonurus Chingianus* Hand.-Maz. to *Gomphandra*, conforms to this interpretation of Blume's genus. Howard, on the other hand, Jour. Arnold Arb. **21**: 461-471. 1940, discussed the case at length and reached entirely different conclusions. He recognized *Urandra* Thwaites to include *Stemonurus secundiflorus* Blume, *Gomphandra* Wallich to take various other species described under *Stemonurus*, and *Medusanthera* Seem. to take still others. He calls attention to the differences in Blume's amplified generic description of 1850 as compared with the original of 1825 and notes particularly that in this amplified description he lists specific characters of *Stemonurus secundiflorus* Blume, the species being one of those on which the original generic description was based. Here I would interpret Blume's action as slightly modifying his original description and making it even more applicable to the *Stemonurus secundiflorus* complex, as well as selecting this species for his detailed illustration of the genus as evidence that he considered this to be particularly typical of his genus *Stemonurus*; however, this can be considered as evidence only, not proof. The fact that Beccari, Valeton, and Koorders and Valeton successively and specifically selected *Stemonurus secundiflorus* Blume as the type

of the genus in their interpretation of *Stemonurus* Blume is all that is needed to typify the genus, and to stabilize the name *Stemonurus*. The International Code recommends that if an author has revised a genus and if he has designated a type as Beccari did, followed by Valetton, and by Koorders and Valetton, this choice should stand except for very special reasons; and there seems to be no special reason for abandonment of Beccari's conclusions and those of other authors who have followed him. The retention of *Stemonurus* Blume as thus interpreted by Beccari and others will result in much fewer changes in names than would otherwise be the case. Under the circumstances I do not accept Howard's conclusions, and here retain *Gomphandra* Wallich. *Stemonurus* Blume is also retained for a group of species in the *S. secundiflorus* complex with *Urandra* Thwaites as a synonym.

#### SABIACEAE

##### **Meliosma coriacea** sp. nov. § *Simplices*.

Species *M. sterrophyllae* Merr. affinis, differt nervis lateralibus paucioribus, floribus in ramulis ultimis glomerato-spicatum dispositis. Arbor circiter 8 m. alta, inflorescentiis exceptis glabro; ramulis ultimis circiter 4 mm. diametro; foliis simplicibus, oblongo-ellipticis, integris, coriaceis, 12–18 cm. longis, 6–7 cm. latis, obtuse acuminatis, basi acutis vel subdecurrenter cuneatis, in sicco supra castaneis, subtus pallide brunneis, utrinque subnitidis; nervis primariis utrinque circiter 8, supra subobscuris, subtus valde elevatis, perspicuis, curvatis, circiter ad marginem arcuato-anastomosantibus, reticulis distinctis; petiolo glabro, 2.5–3.5 cm. longo; paniculis erectis, multifloris, terminalibus et ex axillis defoliatis, pedunculatis, 12–20 cm. longis, partibus vetustioribus parce, junioribus subdense breviter subadpresso pallide subferrugineo-hirsutis, ramis primariis distantibus, longioribus ad 6 cm. longis; floribus numerosis, in ramulis ultimis subglomerato-spicatum confertis, sessilibus vel ultimis breviter pedicellatis, bracteolis suborbiculari-ovatis, rotundatis, 0.8 mm. longis, margine brevissime ciliato-hirsutis; sepalis 5, orbiculari-ovatis, circiter 1 mm. longis, margine brevissime ciliato-hirsutis exceptis glabris, binis exterioribus quam interioribus paulo angustioribus; petalis orbiculari-ovatis, rotundatis, circiter 1.8 mm. longis, margine minute breviter ciliato-hirsutis, utrinque glabris; staminibus fertilibus 2, filamentis vix 1 mm. longis, glabris, appendicibus dorsalibus bifidis, lobis membranaceis, linearibus, circiter 0.5 mm. longis, sterilibus (staminodeis) circiter 1 mm. longis; ovario ovoideo, glabro, cum stylo circiter 1.5 mm. longo.

INDO-CHINA, Sontoy Province, Mount Bavi, *Pételot* 2585, October 2, 1940, alt. about 800 m.

##### **Meliosma longipes** sp. nov. § *Simplices*.

Arbor 7–8 m. alta, inflorescentiis exceptis glabra, ramulis ultimis circiter 5 mm. diametro, plus minusve lenticellatis, pallide brunneis; foliis longissime (8–10 cm.) petiolatis, obovatis vel obovato-ellipticis, coriaceis, integris, utrinque glabris, 22–33 cm. longis, 11–17 cm. latis, in sicco supra atro-olivaceis, opacis, subtus pallide brunneis, apice (haud viso) ut videtur acutis vel acuminatis, basi acutis; nervis primariis 2.5–4 cm. distantibus, utrinque circiter 10, supra vix impressis, subtus valde elevatis, perspicuis, circiter ad marginem arcuato-anastomosantibus, reticulis primariis ter-



tiariisque perspicuis, elevatis; petiolo glabro, ad 10 cm. longo; paniculis terminalibus et ex axillis defoliatis, 15–25 cm. longis, erectis, pedunculatis, ramis primariis paucis, distantibus, longioribus ad 12 cm. longis, conperse breviter subadpresse subferrugineo-hirsutis (praesertim partibus junioribus), floribus in ramulis ultimis racemose dispositis, haud glomeratis, pedicellis crassis, breviter adpresse hirsutis, 1–1.5 mm. longis, bracteolis late ovatis, circiter 1 mm. longis, subacutis, parce breviter adpresse hirsutis; sepalis 5, binis exterioribus ellipticis, trinis interioribus suborbiculari-ovatis vel subreniformi-ovatis, omnibus circiter 1.2 mm. longis, rotundatis, ad marginem brevissime ciliatis; petalis 3, margine minute breviter ciliato excepto glabris, suborbicularibus vel obovato-orbicularibus, circiter 2 mm. longis, 2–2.5 mm. latis; filamentis fertilibus glabris, 1 mm. longis, appendicis dorsalibus bifidis, lobis linearibus, 0.5 mm. longis, sterilibus (staminodeis) 3 circiter 1 mm. longis et latis, partibus apicalibus incurvatis, sulcatis, filamentis latissimis; ovario ovoideo, glabro, cum stylo circiter 1.5 mm. longo, 2-loculari, stylo crasso, sursum angustato.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 2588, October 2, 1940, alt. about 800 m.

Among the simple-leaved species with very large, entire, glabrous blades, this is very strongly characterized by its unusually long petioles, the longest one seen being 10 cm. in length.

*Meliosma angustifolia* Merr. Philip. Jour. Sci. **21**: 384. 1922; Merr. & Chun, Sun-yatsenia **2**: 11. 1934; Cufodontis, Oesterr. Bot. Zeitschr. **88**: 256. 1939.

*Meliosma crassifolia* Hand.-Maz. Sinensia **3**: 191. 1933.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 2614, 2629, May 24 and July 2, 1940, altitude about 700 m. Kwangsi, Kwangtung, and Hainan.

#### RHAMNACEAE

##### *Rhamnus subapetalus* sp. nov.

Species *Rhamno napalensi* (Wall.) Laws. affinis, differt foliis inflorescentiisque in sicco pallidis, haud nigrescentibus, foliis acutissime subcaudato-acuminatis, inflorescentiis glabris vel sub lente minutissime puberulis, petalis 0 vel quoad visis 1–3 tantum, minutis, lineari-lanceolatis, acuminatis, quam filamentis bene brevioribus, planis. Frutex scandens vel subscandens, omnibus partibus glaberrimis vel inflorescentiis sub lente minutissime puberulis, ramis brunneis, teretibus, subverrucoso-lenticellatis, ramulis ultimis ad 1 mm. diametro; foliis plerumque oblongo-ellipticis, firmiter chartaceis, in sicco pallidis utrinque subconcoloribus nitidisque, 10–15 cm. longis, 4–8 cm. latis, basi late acutis, apice graciliter subcaudato-acuminatis, acuminibus rectis vel falcatis, ad 2 cm. longis, distincte apiculatis, margine anguste cartilagineis, leviter recurvatis, irregulariter subcrenato-serrulatis, dentibus 3–5 mm. distantibus, minute subatro-apiculatis; nervis primariis utrinque 6–8, curvato-adscententibus, subtus elevatis, perspicuis, ad marginem plus minusve arcuato-anastomosantibus, reticulis ultimis distinctis, transverse parallelis, leviter undulatis; petiolo 12–25 mm. longo, glabro; stipulis lanceolatis, acuminatis, 1–1.5 mm. longis, deciduis; inflorescentiis axillariibus, racemosis, efoliatis et 1–3 cm. longis, vel depauperato-paniculatis, ad 6 cm. longis, ramis folia parva (1–2.5 cm. longa) gerentibus; floribus solitariis vel depauperato-fasciculatis, pedicellis circiter 1 mm. longis, minutissime obscureque puberulis; floribus ♂ ut videtur viridibus, 5-meris, circiter

4 mm. diametro, in sicco pallidis haud nigricantibus; sepalis oblongo-ovatis, acutis vel leviter acuminatis, ad 1.5 mm. longis; petalis 0 vel 1-3, minutis, deciduis, lineari-lanceolatis, acuminatis, vix 0.5 mm. longis, quam filamentis bene brevioribus, planis, filamenta haud includentibus; floribus ♀ ♂ simillimis, calycis lobis mox deciduis; stylis brevibus, 3-partitis, mox deciduis; fructibus junioribus globoso-obovoideis, glabris, circiter 5 mm. longis.

INDO-CHINA, Tonkin, Chapa, *Pélot* 2605 (TYPE), 3119, 3121, July 1927 and 1940, scandent in forests, alt. about 1500 m.

When the first material of this apparently distinct species was received in 1928, it was tentatively placed in *Rhamnus napalensis* (Wall.) Laws. in spite of certain manifest differences, especially in the pale rather than black or blackish color of the branchlets, leaves, inflorescences, and flowers, when dry. *Rhamnus napalensis* (Wall.) Laws. is currently credited with a distinctly wide geographic range. To it I have reduced *Rhamnus sumatranus* Ridl. and Rehder has reduced the Chinese *Rhamnus paniculiflorus* Schneider. It is suspected that other proposed species should also be reduced, such as *Rhamnus javanicus* Miq. (already reduced by Koorders), the Philippine *Rhamnus philippinensis* C. B. Rob., and *Rhamnus nigrescens* Lauterb. of New Guinea. In spite of the striking differences in the actual color of the dried specimens of *Rhamnus napalensis* (Wall.) Laws. and *R. subapetalus* Merr., I should have hesitated in proposing the latter as a new species but for the very striking petal characters of the latter, these being totally different from the petals of the *Rhamnus napalensis* (Wall.) Laws. complex; as noted in the description the petals may be entirely wanting, or, if present, then only from 1 to 3 in a flower, slender, obscure, acuminate, flat, shorter than and not wider than the filaments, and not enclosing the latter.

#### VITACEAE

**Tetrastigma Henryi** Gagnep. Not. Syst. 1: 264. 1910.

INDO-CHINA, Tonkin, route from Hanoi to Hoa Binh at Muong Thon, *Pélot* 5975, March 1933, in savannas, alt. about 200 m. Yunnan, Hainan.

With Gagnepain's interpretation of this species as having from palmately 3-foliolate to pedately 5-foliolate leaves, it is difficult to see how *Pélot* 5975 with strictly 5-foliolate pedate leaves can be distinguished. It may be that more than a single species was included in the original description, but in that case it is believed that the species should be interpreted from the first number cited, *Henry* 11756, a form with strictly 3-foliolate leaves. *Henry* 9992, the last number cited by Gagnepain, is very closely matched by *Pélot* 5816 from Chapa, both specimens being in fruit and in about the same stage of development; and yet one hesitates to state that *Pélot* 5975, with pedately 5-foliolate leaves, represents the same species as *Pélot* 5816 with digitately 3-foliolate ones.

**Tetrastigma chapaensis** sp. nov.

Frutex scandens, inflorescentiis exceptis glaber, ramulis ultimis teretibus, brunneis, longitudinaliter striatis, circiter 2 mm. diametro, internodiis 8-10 cm. longis; foliis longe (7-8 cm.) petiolatis, 3-foliolatis, foliolis lanceo-

latis vel oblongo-lanceolatis, chartaceis, olivaceis, graciliter subcaudato-acuminatis, basi acutis, aequilateralibus, vel lateralibus leviter inaequalateralibus, 14–18 cm. longis, 3.5–4.5 cm. latis, margine plus minusve undulatis, distanter (1–2 cm.) serratis, dentibus apice callosis; nervis primariis utrinque circiter 10, gracilibus, subtus elevatis, distinctis, curvato-adscendentibus, ad marginem arcuato-anastomosantibus, reticulis primariis gracilibus, distinctis, laxis; petiolulis valde inaequalibus, lateralibus 8 mm., centralibus 2.5 cm. longis; inflorescentiis axillaribus, solitariis, longe (4–5 cm.) pedunculatis, radiatim 4-ramosis, ramis circiter 3 cm. longis, floribus subaxe cymosim dispositis, partibus floriferis 4–5 cm. latis, ramis et pedicellis breviter subpappilose brunneo-pubescentibus, pedicellis circiter 3 mm. longis, pedunculo in parte 1–3 inferiore bracteis 4 oppositas ellipticas rotundatas subinduratas concavas glabras subpatulas ferentibus; calycibus breviter subpapillatim brunneo-pubescentibus; petalis 4, glabris, oblongis, 2 mm. longis, apice cucullatis, dorso brevissime corniculatis; ovario styloque glabro, stylo 1 mm. longo, stigmatibus 4, brevis, radiatis.

INDO-CHINA, Tonkin, Chapa, *Pételot* 3074, July 1927, alt. about 1500 m.

A species, in accordance with Gagnepain's treatment of the genus, allied to *Tetrastigma erubescens* Planch. but with differently shaped very much larger leaflets.

#### ELAEOCARPACEAE

**Elaeocarpus limiteanus** Hand.-Maz. *Sinensia* **3**: 193. 1933; Merr. & Chun, *Sun-yatsenia* **2**: 63. 1935.

*Elaeocarpus Maclurei* Merr. *Lingnan Sci. Jour.* **13**: 63. 1934.

INDO-CHINA, Tonkin, Chapa, *Pételot* 1787, 3582, 6156, April 1925, August 1929, and July 1931, in forests, alt. about 1500 m. Kwangsi and Hainan.

Handel-Mazzetti's species was based on a fruiting specimen from Kwangsi and *E. Maclurei* Merr. was described from a Hainan flowering specimen. With abundant material in all stages of development from Kwangsi, Hainan, and now northern Indo-China, I see no valid reason for trying to distinguish two species here. There is an isotype of Handel-Mazzetti's species in the Britton Herbarium, New York Botanical Garden.

**Elaeocarpus linearifolius** Knuth, *Repert. Sp. Nov.* **49**: 66. 1940.

This species was based on *Pételot* 3748 from Chapa, Tonkin, Indo-China, and *Clemens* 3484 from the vicinity of Tourane, Annam. I have seen no specimens that I consider to be referable to Knuth's species.

**Elaeocarpus Petelotii** sp. nov. § *Monocera*.

Arbor, inflorescentiis floribusque exceptis glabra, ramulis ultimis teretibus, 4–5 mm. diametro, novellis plus minusve resinosis; foliis plus minusve confertis, oblongo-ellipticis vel anguste oblongo-obovatis, coriaceis, utrinque glaberrimis et minute distanter verruculosus, 9–11 cm. longis, 3.5–5 cm. latis, breviter obtuse acuminatis, basi acutis, margine crenato-serrulatis, dentibus 3–7 mm. distantibus, minute atro-apiculatis, in sicco pallide brunneo-viridibus, supra plerumque nitidis, subtus opacis, paullo pallidioribus, nervis primariis utrinque 7–8, subtus leviter elevatis, curvatis, arcuato-anastomosantibus; petiolo glabro, circiter 1.5 cm. longo; racemis numerosis in ramulis ultimis cum foliis confertis, 6–7 cm. longis, glabris vel parcissime pubescentibus, pedicellis glabris vel subglabris, 6–7 mm. longis; floribus 5-meris,



9 mm. longis; sepalis lanceolatis, acuminatis, 9 mm. longis et 2 mm. latis, coriaceis, extus glabris, in sicco brunneis, intus deorsum perspicue carinatis et glabris vel subglabris sursum cum margine breviter cinereo-pubescentibus; petalis angustis, anguste oblongis, sursum vix vel leviter ampliatis, sepala aequantibus, circiter 1.5 mm. latis, intus dense retrorse hirsutis, deorsum margine plus minusve inflexis perspicue carinatis, extus dense breviter pallide adpresse pubescentibus, sursum (3 mm.) in lacinias 12–14 graciles 2–2.5 mm. longas fissis; staminibus circiter 25, filamentis (1.5–2 mm.) et antheris lineari-oblongis (3.5–4 mm.) minute scaberulis, loculo uno obtuso, altero breviter (0.7 mm.) aristato; disco circiter 2 mm. diametro, glandulis 5, retusis vel bifidis, leviter connatis, parcissime breviter pubescentibus; ovario ovoideo, 2 mm. longo, dense breviter adpresse pallide hirsuto, 3-loculari, loculis 6-ovulatis; stylo 4–4.5 mm. longo, leviter pubescente.

INDO-CHINA, Tonkin, Massif de Tam Dao, *Pételot* 4580, December 1930.

By Gagnepain's arrangement of the Indo-Chinese species, this falls in the group with *Elacocarpus Bonii* Gagnep. but it has larger flowers than those of the latter species, the petals with more numerous laciniae. By Corner's different arrangement of the Malay Peninsula species (Gard. Bull. Straits Settlements **10**: 310–316. 1939) it falls in his pentamerous group, section B.

*Sloanea sinensis* (Hance) Hemsl. Hook. Ic. **27**: sub *t.* 2628. 1900; Hu, Jour. Arnold Arb. **5**: 230. 1924; \*Rehd. op. cit. **15**: 91. 1934.

*Echinocarpus sinensis* Hance, Jour. Bot. **22**: 108. 1884.

INDO-CHINA, Annam, Mt. Bana, *Clemens* 3897, May–July 1927, a small tree in forests. Hunan, Chekiang, Fukien, Kwangtung, Kweichow and Kiangsi.

Gagnepain, in Lecomte, Fl. Gén. Indo-Chine **1**: 563. 1910, may have included this form in his conception of *Sloanea Sigun* (Blume) K. Sch., but the cited specimen from Indo-China conforms with Hance's species, the spines on the relatively small capsules being slender and densely arranged. In Blume's Javan type the spines are stouter and are very loosely arranged, as well illustrated by Koorders and Valeton, Atlas, Baumart. Java **3**: *t.* 434. 1914. The allied Chinese form that Gagnepain has illustrated in Lecomte, Fl. Gén. Indo-Chine **1**: 563. *f.* 59. 1910, and Not. Syst. **1**: 165. *f.* 7. 1910, as *Sloanea Hanceana* Hemsl. (*Echinocarpus sinensis* Hemsl. Ann. Bot. **9**: 147. 1895, non Hance 1884) is *Sloanea Hemsleyana* (Ito) Rehd. & Wils. in Sargent, Pl. Wils. **2**: 361. 1915 (*Echinocarpus Hemsleyanus* Ito, Jour. Sci. Univ. Tokyo **12**: 349. 1899). Other synonyms of *Sloanea sinensis* (Hance) Hu are *Castanopsis Cavaleriei* Lév. and *Sloanea chengfangensis* Hu. I do not think that *Sloanea hongkongensis* Hemsl. in Hook. Ic. **27**: *t.* 2628. 1900 can be distinguished from *S. sinensis* (Hance) Hemsl.

#### STERCULIACEAE

*Sterculia Henryi* Hemsl. Kew Bull. **1908**. 179. 1908.

INDO-CHINA, Tonkin, Chapa, *Pételot* 5809, April 1936, a shrub 1–1.5 m. high, on banks of a ravine, alt. 1300 m. Yunnan.

When first studied, this specimen was indicated as an apparently new

\*While Hu in 1924 independently transferred Hance's species to *Sloanea*, Hemsley had already made the transfer in 1900 thus: "*[Sloanea] sinensis*, Hemsl. (*Echinocarpus*, Hance)" and the authority should be Hemsley.

species, dedicated to the collector, but on critical reconsideration I conclude that *Sterculia Henryi* Hemsl. is represented. The Chapa material has somewhat wider leaves than Hemsley admits for *Sterculia Henryi* Hemsl., described as 4–6 cm. wide, but the maximum width of one of our Henry specimens from Yunnan is 9 cm., and 9 cm. is the maximum width on the Pételot specimen above cited. The indumentum, inflorescence, bracteole, and floral characters are the same as in Hemsley's species, while the habit (a small shrub) and the characteristic crowded bracts or stipules at the tips of the branches are also identical.

#### DILLENACEAE

*Saurauia macrotricha* Kurz ex Dyer in Hook. f. Fl. Brit. Ind. 1: 287. 1874.

INDO-CHINA, Tonkin, Chapa, Massif de Fan Tsi Pan, *Pételot* 2689, July 1940, a shrub 4–5 m. high with red flowers, in open forests, alt. about 1300 m. Burma, Yunnan, and Khasia (Jaintia Hills, *Ruse* 152).

The original and only published description is very incomplete, but the above cited specimen conforms to the brief characters as given, and the specimen moreover matches *Rusc* 152, determined at Calcutta as representing Kurz's species. The type was from either Burma or Yunnan, both localities being cited in the original description; I have seen no Yunnan or other Chinese material that I consider to represent Kurz's species.

#### THEACEAE

*Camellia pubicosta* sp. nov. § *Eucamellia*

Frutex 4–5 m. altus, ramis teretibus, glabris, ramulis ultimis circiter 1.5 mm. diametro, breviter subpatule pubescentibus; foliis oblongis vel late oblongo-lanceolatis, 12–15 cm. longis, 4–5.5 cm. latis, chartaceo-coriaceis, perspicue subcaudato-acuminatis, acuminibus gracilibus, obtusis, 1.5–2 cm. longis, basi late acutis vel obtusis, margine, basi acumineque exceptis, distincte serrato-crenatis, dentibus 4–6 mm. distantibus, in sicco utrinque minutissime verruculosus, supra olivaceis vel olivaceo-viridibus, plus minusve nitidis, glaberrimis, subtus plerumque brunneis, secus costam dense subadpresso cinereo-pubescentibus, nervis obscure pubescentibus glabrescentibus; nervis primariis utrinque 12–14, supra impressis, subtus elevatis, perspicuis, leviter curvatis, arcuato-anastomosantibus, petiolo breviter pubescenti, 3–5 mm. longo; floribus in axillis superioribus, solitariis vel binis, 2 cm. diametro, ut videtur albidis, pedicellis glabris, circiter 8 mm. longis, bracteolis oblongo-ovatis, acutis vel acuminatis, circiter 2 mm. longis; sepalis exterioribus ovatis, acutis, 2–3 mm. longis, margine breviter ciliatis, interioribus majoribus, subreniformibus, rotundatis, ad 4 mm. latis; petalis utrinque glabris, minutissime verruculosus, subellipticis vel obovato-ellipticis, rotundatis, 11 mm. longis, 7 mm. latis; staminibus numerosissimis, filamentis glaberrimis, in parte libera filiformibus, 4–8 mm. longis, deorsum (2 mm.) connatis, tubum glabrum formantibus; ovario ovoideo, dense adpresse hirsuto; stylis 3, liberis, circiter 8 mm. longis, deorsum densissime, sursum sparsim adpresse hirsutis; fructibus globosis, 2.5 cm. diametro, vix vel tarde dehiscentibus, pericarpio minute verruculoso, crustaceo, vix 0.5 mm. crasso, glabro vel versus apicem plus minusve adpresse hirsuto; seminibus solitariis, globosis, 1.8 cm. diametro, brunneis, nitidis.

INDO-CHINA, Sontoy Province, Mount Bavi, *Pételot* 1727 (TYPE, flower), 2598 (fruit) Nov. 19, 1924, Aug. 28, 1940, a shrub 4 to 5 m. high, at altitudes from 400 to 800 m.

The first specimen of this, in flower, received at the University of California in 1925, was placed tentatively with *Camellia sinensis* (Linn.) O. Kuntze, where it manifestly does not belong, as verified in 1941 when a fruiting specimen was received from the same locality (Mount Bavi). It is distinguishable by its prominently nerved, subcaudate-acuminate, toothed leaves, its three free styles, numerous glabrous filaments united into a short tube, and its apparently indehiscent, 1-seeded globose fruits, the very thin pericarp being crustaceous.

**Schima khasiana** Dyer in Hook. f. Fl. Brit. Ind. **1**: 289. 1874, var. **sericans** Hand.-Maz. Anz. Akad. Wiss. Wien Math.-Nat. Kl. **61**: 108. 1924, Symb. Sin. **7**: 396. 1931.

INDO-CHINA, Tonkin, route from Laokay to Chapa, *Pételot* 3109, July 1927, a tree, 12 m. high, alt. 1900 m. Yunnan.

This specimen, in fruit, agrees very closely with an isotype of Handel-Mazzetti's variety (in flower). It impresses me as a very weak variety which perhaps should be merged with the species.

**Schima khasiana** Dyer var. **macrocarpa** var. nov.

A typo differt fructibus multo majoribus, globosis vel depresso-globosis, circiter 3 cm. diametro et 2.5 cm. alto.

INDO-CHINA, Tonkin, Chapa, *Pételot* 5802, August 1931, a small group of trees about 15 m. high, altitude 1500 m.

It may be desirable to make some other disposition of this large fruited form when flowering material becomes available. In vegetative characters it closely approximates *Schima khasiana* Dyer, and, to a degree approaches the var. *sericans* Hand.-Maz. in that the leaves are slightly pubescent beneath especially along the midrib in the lower part. The species occurs in northern India, Burma, southeastern Tibet and Yunnan.

#### DIPTEROCARPACEAE

**Vatica subglabra** sp. nov. § *Synaptea*.

Arbor magna, inflorescentiis minute pubescentibus exceptis glabra, vel ramulis novellis minutissime brevissime stellato-pubescentibus glabrescentibus; ramis teretibus, subcinereis vel subcinereo-brunneis, glabris, ramulis ultimis gracilibus, 1–1.5 mm. diametro, lenticellatis, brunneis, glabris, vel novellis minutissime breviter stellato-pubescentibus, indumento subferrugineo vel subcinereo; foliis chartaceis, oblongo-ellipticis, acuminatis, basi rotundatis vel latissime acutis, in sicco plerumque pallide olivaceis, utrinque subconcoloribus, 7–13 cm. longis, 2.5–5.5 cm. latis; nervis primariis utrinque 10–12, gracilibus, subtus leviter elevatis; petiolo glabro, 5–8 mm. longo; stipulis non visis, ut videtur deciduis; inflorescentiis axillaribus terminalibusque, 7–10 cm. longis, partibus vetustioribus glabris, junioribus minute breviter stellato-pubescentibus, indumento cinereo; floribus extus dense breviter cinereo-pubescentibus, pedicellis 3–5 mm. longis, minute stellato-pubescentibus; calycis lobis utrinque breviter cinereo-pubescentibus, binis paullo majoribus oblongis, rotundatis, 1–1.2 mm. longis, trinis minoribus paullo angustioribus, circiter 1 mm. longis, lanceolatis, acutis vel obscure acuminatis; petalis extus dense brevissime cinereo-pubescentibus, intus glabris, oblongis, vel deorsum leviter angustatis, obtusis; staminibus 15, filamentis



brevissimis, antheris 0.5 mm. longis, subtruncatis vel connectivo brevissime producto; ovario subdepresso, minute alveolato, minute puberulo; stylo tereti, glabro, 0.4 mm. longo, stigmatibus 3, minutis; fructibus globosis, circiter 7 mm. diametro, glabris vel consperse minute subgranulosis, sepalis persistentibus accrescentibus, erectis, glabris, binis majoribus oblongis, chartaceo-membranaceis, plerumque oblongis vel deorsum leviter angustatis, basi late acutis, apice rotundatis, 5-nerviis, reticulatis, 5-6 cm. longis, 1.4-1.7 cm. latis, trinis minoribus oblanceolatis, acutis vel obscure acuminate, 5-nerviis, 1.6-2 cm. longis, 4-5 mm. latis.

INDO-CHINA, Sontoy Province, To Phap, *Pételot* 2600 (TYPE, fruit), 2610, 2643, June 2, July 7, and August 15, 1940, a large tree near water courses.

This species clearly belongs in the group with *Vatica astrotricha* Hance, *V. jaginea* Dyer, and *V. Dyeri* King, differing from all of them in its indumentum, which occurs only on the very youngest branchlets, the younger parts of the inflorescences, and on the flowers; this indumentum is minute and consists of more or less scattered, very short, cinereous or, at times, subferrugineous stellate hairs of a type quite different from that of the three species listed above. *Vatica tonkinensis* A. Chev. Bull. Écon. Indo-Chine **20**: 799. 1918, remains undescribed, like the considerable number of other proposed new species in various families whose names appear in the same paper.

#### FLACOURTIACEAE

***Homalium tonkinense*** sp. nov. § *Blackwellia*.

Arbor circiter 6 m. alta, inflorescentiis paniculatis exceptis glaberrima; ramulis ultimis 1.5-2 mm. diametro, in sicco atris vel subatris; foliis oblongis vel oblongo-lanceolatis, perspicue longe acuminatis, subcoriaceis, 8-11 cm. longis, 3-4 cm. latis, basi acutis, in sicco supra nitidis, subtus paullo pallidioribus, margine subundulato-crenatis; nervis primariis utrinque 7-8, subtus elevatis, curvato-subadscendentibus, distinctis; petiolo 5-7 mm. longo, glabro; inflorescentiis paniculatis, paniculis terminalibus axillari-busque, amplis, multifloris, 9-15 cm. longis, subcinereo-pubescentibus, pilis brevibus, haud adpressis, ramis primariis ad 5 cm. longis; floribus 6-meris, in ramis ramulisque racemose dispositis, verticillatim-subfasciculatis haud confertis, circiter 3 mm. longis, articulatis, breviter patule ciliatis; calycis tubo subobconico, 2 mm. longo, vix vel obscure longitudinaliter sulcato, breviter patule pubescenti; sepalis 6, anguste oblongis vel lineari-oblongis, obtusis vel acutis, 2-2.5 mm. longis, longe ciliatis; petalis sepalis simillimis et aequantibus; staminibus 6, filamentis ad 4 mm. longis, deorsum longe consperse ciliatis, sursum glabris; ovario consperse longe ciliato; stylis 3, glabris vel basi consperse ciliatis, 2 mm. longis.

INDO-CHINA, Tonkin, Vinh Yen Province, route from Vinh Yen to Tam Dao, Dont des Linh, *Pételot* 6164, Oct. 15, 1936.

This species is most closely allied to *Homalium paniculiflorum* Merr. & Metc., of Hainan, which it closely resembles, but from which it may be readily distinguished by its differently shaped, long-acuminate leaves as well as by being entirely glabrous except for the inflorescences, while the indumentum on the latter is not appressed. The styles and filaments are distinctly shorter than in the Hainan species. Both species are manifestly allied to *Homalium cochinchinense* (Lour.) Druce (*H. jagifolium* Benth.),

from which they may be at once distinguished by their paniculate rather than strictly racemose inflorescences.

#### PASSIFLORACEAE

##### *Passiflora pertriloba* sp. nov. § *Decaloba-Polyanthea*.

Planta ut videtur herbacea, scandens, cirrhosa, ramis gracilibus, plus minusve villosis glabrescentibus, vix 2 mm. diametro, ramulis gracilioribus; foliis alternis, perspicue 3-lobatis, fere hastatis, ad 7 cm. longis et 8 cm. latis, basi latissime subtruncato-rotundatis, minute cordatis, 3-nerviis, subchartaceis, in sicco olivaceis, utrinque glabris vel junioribus ad costam nervosque leviter pubescentibus, margine breviter hirsutis, lobis ovatis, acutis vel leviter acuminatis, lobis terminalibus majoribus, 2.5–5 cm. longis, 2–4 cm. latis, lateralibus patulis, ad 2.5 cm. longis latisque; petiolo plus minusve hirsuto, 1.3–4 cm. longo, infra medio biglanduloso, glandulis subsessilibus vel brevissime stipitatis, ad 0.8 mm. diametro, subpatelliformibus; stipulis linearilanceolatis, graciliter acuminatis, pubescentibus, 4–5 mm. longis; floribus circiter 1.5 cm. diametro, plerumque 2–3-fasciculatis, axillaribus, pedicellis gracilibus ad 1 cm. longis, leviter pubescentibus, articulatis; calycibus glabris, lobis oblongo-lanceolatis, sursum angustatis, acutis, leviter acuminatis vel subobtusis, distincte reticulatis, circiter 6 mm. longis; coronae laciniae numerosae 2–4 mm. longae, 0.25 mm. latae, deorsum leviter angustatae; androgynophoro glabro, 4 mm. longo; staminibus 5, filamentis 2.5–3 mm. longis, antheris oblongo-ellipticis, 3 mm. longis; ovario glabro, subellipsoideo, stylis 2–3 mm. longis, stigmatibus capitatis.

INDO-CHINA, Tonkin, Hanoi, in hedges at the Mot Cot pagoda, *Pételot* 2482, Feb. 1938.

A species belonging in the general group with *Passiflora Leschenaultii* DC. and strikingly different from all the species hitherto described from Indo-China and contiguous areas. The leaves are prominently 3-lobed, almost hastate in shape, all lobes acute or slightly acuminate, the terminal one larger than the lateral ones, the latter distinctly spreading. The leaf shape in general reminds one of some of the species of *Acer* with 3-lobed leaves and some forms of *Hedera helix* Linn.

#### ELAEAGNACEAE

##### *Elaeagnus Delavayi* Lecomte, Not. Syst. **3**: 156. 1915.

INDO-CHINA, Tonkin, Chapa, *Pételot* 4466, Oct. 1932, in shrubby savannas, alt. 1500 m. Yunnan.

This specimen agrees with the original description and matches an isotype of Lecomte's species in the herbarium of the Arnold Arboretum.

*Elaeagnus Loureirii* Champ. Hook. Jour. Bot. Kew Gard. Miscel. **5**: 196. 1853; Serv. Beih. Bot. Centralbl. **25**(2): 68. f. 3, 12–15. 1909; Rehd. in Sargent, Pl. Wils. **2**: 416. 1915.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2121, Dec. 28, 1938, a shrub with long sprawling branches in shrubby savannas, alt. 1500 m. Hongkong, Kwangtung, and Yunnan.

This number was originally identified as representing *Elaeagnus gonyanthes* Benth., to which it cannot be referred. It agrees very closely with Hongkong and Yunnan material and with the published descriptions of Champion's species.

## ARALIACEAE

**Panax pseudo-ginseng** Wall. Trans. Soc. Med. Phys. Calcutta **4**: 117. 1829, Pl. As. Rar. **2**: 30. *t.* 137. 1831.

*Aralia pseudo-ginseng* Benth. ex C. B. Clarke in Hook. f. Fl. Brit. Ind. **2**: 721. 1879.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2489, April 1935, in open forests, alt. 1500 m. Himalayan region to Yunnan.

The Index Kewensis reference to Wallich's species is his 1831 publication, but the species was described in detail in 1829, cited by Wallich as "Act. Soc. Med. Phys. Calcutta iv. 117." This is the "Transactions" and the volume, which I have examined, was published in 1829. Pitard had only rhizomes of a *Panax* from Indo-China and included a short generic description only in Lecomte, Fl. Gén. Indo-Chine **2**: 1162. 1923.

## CORNACEAE

**Cornus controversa** Hemsl. Bot. Mag. **135**: sub. *t.* 8261. 1909; Kew Bull. **1909**: 331. 1909; Wang, Pflanzenr. **41**(iv. 229): 49. 1910; Nakai, Fl. Sylv. Kor. **16**: 81. *t.* 25, 26. 1927.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2485, April 1936, in shrubby savannas, alt. 1500 m. Himalayan region through China to Kwangtung and Shantung to Korea, Japan, and Formosa.

Hitherto a single species has been credited to Indo-China, *Cornus capitata* Wall.: Evrard in Lecomte, Fl. Gén. Indo-Chine **2**: 1192. 1923. In addition to the very characteristic and widely distributed *Cornus controversa* Hemsl., which is well characterized by its large alternate leaves, the following opposite-leaved Indo-Chinese species is described as new:

**Cornus oligophlebia** sp. nov. § *Thelecrania*, *Amblycaryum*.

Arbor 12–15 m. alta, ramis ramulisque glabris, ramulis in sicco subatris vel atro-brunneis, ultimis 2.5–3 mm. diametro novellis plus minusve adpresse ferrugineo-pubescentibus; foliis ellipticis vel elliptico-ovatis, acuminatis, basi late acutis vel rotundatis, coriaceis, rigidis, utrinque subconcoloribus vel subtus paullo pallidioribus, subnitidis vel opacis, in sicco olivaceis vel atro-olivaceis, 8–14 cm. longis, 4–8 cm. latis, glabris, vel utrinque conspersissime breviter adpresse subalbido-pubescentibus glabrescentibus; nervis primariis utrinque 3, subtus elevatis, perspicuis, curvatis vel curvato-adscedentibus, obscure arcuato-anastomosantibus; petiolo crasso, 1–2 cm. longo, glabro vel consperse subadpresse subferrugineo-pubescenti, alabastris axillaribus (quoad visis) adpresse ferrugineo-pubescentibus; inflorescentiis terminalibus, amplis, cymoso-paniculatis, pedunculatis, 8–11 cm. latis, apertis, multifloris, pedunculo 2–3 cm. longo, ramis inferioribus 4–6 cm. longis, patulis, partibus vetustioribus glabris vel glabrescentibus, in sicco subatris, partibus junioribus breviter consperse subadpresse pubescentibus; floribus albidis, pedicellis 1–1.5 mm. longis, breviter adpresse cinereo-pubescentibus; calycibus plus minusve urceolatis, 2 mm. longis, subdense breviter adpresse cinereo- vel subferrugineo-pubescentibus, dentibus 4, brevissimis, acutis, vix 0.5 mm. longis; petalis oblongis, circiter 3 mm. longis et 1.3 mm. latis, acutis, extus brevissime conspersissime adpresse pubescentibus; filamentis glabris, petalis aequilongis; antheris 1.5 mm. longis; stylo cylindraceo, 2 mm. longo, obscure longitudinaliter striato-sulcato, glabro, stigmatibus punctiformi vel brevissime 2-lobato.



INDO-CHINA, Tonkin, Chapa, *Pételot* 2484 (TYPE), 3268, July 1928 and August 1931, altitude 1400–1500 m.

The alliance of this species is clearly with *Cornus Wilsoniana* Wang., which is represented by specimens from Hupeh and Kwangtung. It differs in its much larger, thicker, differently shaped, glabrous or nearly glabrous leaves, which are of about the same color on both surfaces, olivaceous or atro-olivaceous when dry, not pale as in Wangerin's species, the primary reticulations being evident, especially beneath, these being slender and obscure or even obsolete in *Cornus Wilsoniana* Wang.

Var. *impressinervis* var. nov.

A typo differt foliis angustioribus (7–12 cm. longis, 3–4 cm. latis) graciliter acuminatis, nerviis primariis supra impressis, inflorescentiis minoribus (5–6 cm. latis), floribus paullo majoribus.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2484, August 1940, a tree 8–10 m. high, altitude 1500 m.

Additional material may well prove that this form, here placed as a variety, may be worthy of specific rank.

#### ERICACEAE

*Lyonia annamensis* (Dop) comb. nov.

*Pieris annamensis* Dop in Lecomte, Fl. Gén. Indo-Chine **3**: 726, f. 82, 4–10. 1930.

*Poilane* 3574 in the herbarium of the Arnold Arboretum, named by Dr. Dop, is apparently an isotype (the collector but not the number is cited in the original description). It is in all respects a *Lyonia* (*Xolisma*) for those who retain this as a generic segregate from *Pieris*.

*Lyonia chapaensis* (Dop) comb. nov.

*Pieris chapaensis* Dop in Lecomte, Fl. Gén. Indo-Chine **3**: 726. 1930.

INDO-CHINA, Tonkin, Chapa, *Pételot* 3214, May 1931, altitude about 1400 m. The type was from the general vicinity of Chapa.

Dr. Dop records two other species of *Pieris* from Indo-China. *P. ovalifolia* D. Don is *Lyonia ovalifolia* (D. Don) Drude (*Xolisma ovalifolia* Rehd.), a species very widely distributed in Asia, while *Pieris langbianensis* A. Cheval. ex Dop op. cit. 728 is apparently a *Lyonia*; I have seen no material representing the latter species.

*Rhododendron oxyphyllum* Franch. Jour. de Bot. **12**: 264. 1898; Hutch. in Sp. Rhod. 621. 1930.

INDO-CHINA, Tonkin, Chapa, Lo Qui Ho Peak, *Pételot* 2343, April 1938, alt. 2200 m. Yunnan, Kwangsi, and Siam.

This specimen, with entirely glabrous ovaries, peculiarly simulates another collection from Chapa, *Pételot* 6260, that I have referred to *Rhododendron laoticum* P. Dop, ex descr., but which has very densely pubescent ovaries. Dop describes the corolla lobes of this as *linear* and 2 cm. long, but does not indicate their width. This is probably an error, as *linear* petals scarcely occur in *Rhododendron*. In *Pételot* 6260 the corolla lobes are oblong, about 2 cm. long and 10–12 mm. wide.

#### OLEACEAE

*Jasminum trineuron* Kobuski, Brittonia **4**: 167. 1941.

INDO-CHINA, Tonkin, Bac Giang Province, Minh Le, *Pételot* 2524, Feb. 1938, det. Kobuski. Type from Burma, the species also in Hainan.

***Linociera macrothyrsa* sp. nov.**

Arbor parva, circiter 5 m. alta, glabra vel subglabra, ramis pallide brunneis, glabris, conspersissime lenticellatis, ramulis ultimis subcastaneis, minutissime subfurfuracei-lepidotulis; foliis amplis, chartaceis vel subcoriaceis, oblongo-ellipticis, 12–22 cm. longis, 4–8 cm. latis, integerrimis, in sicco brunneis vel pallide olivaceo-brunneis, utrinque subconcoloribus, glabris vel junioribus supra minutissime lepidotulis, breviter obtuseque acuminatis, basi acutis, late acutis vel leviter decurrentibus, subtus secus costam nervosque minute verruculosus, vetustioribus supra uniformiter minutissime verruculosus; nervis primariis utrinque circiter 12, subpatulis, distantibus, versus marginem curvatis, obscure arcuato-anastomosantibus, reticulis laxis, cum nervis subtus satis distinctis; petiolo 3–3.5 cm. longo minute sublepidoto glabrescenti; inflorescentiis axillaribus, longe pedunculatis (pedunculo 3.5–6 cm. longo), paniculatis, cum pedunculis 13–18 cm. longis, glabris vel partibus junioribus obscurissime breviter pubescentibus, ramis primariis oppositis, paucis, patulis, longioribus 3.5–5 cm. longis; floribus subaxe dispositis, plerumque longe (3–5 mm.) pedicellatis, bracteis lanceolatis, 3–5 mm. longis, lanceolatis, vel inferioribus quoad visis oblanceolatis, foliaceis, ad 1.5 cm. longis et 2.5 mm. latis; floribus ♂ et ♀; sepalis oblongo-ovatis, obtusis acutis vel leviter acuminatis, circiter 1 mm. longis, margine breviter ciliatis, ceteroquin glabris; petalis subliberis vel deorsum minute connatis, ellipticis vel oblongo-ellipticis, glabris, 3–4 mm. longis, 1.5–2 mm. latis, sursum haud angustatis, apice rotundatis; filamentis brevissimis 0.5 mm. longis, crassis, antheris ellipticis vel oblongo-ellipticis, 2 mm. longis; ovario glabro, anguste ovoideo; stylo vix 1 mm. longo.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2690, August 1940, a white flowered tree about 5 m. high in open forests, altitude about 1500 m.

This species is characterized by its large, long-petioled leaves, its ample, long-peduncled, open panicles, and its unusually large flowers. Staminate and perfect flowers occur in the same inflorescences, there being no differences between them except in the absence of the ovary in the former. By Gagnepain's arrangement of the Indo-Chinese species, it falls in the group with *Linociera macrophylla* Wall., but it is remote from that species, both as represented by the published descriptions and by many specimens available for comparison from India, Siam, Indo-China, and China.

***Linociera subcapitata* sp. nov.**

Frutex vel arbor parva, glaberrima, ramis pallide brunneis, teretibus, obscure lenticellatis, ramulis ultimis circiter 1.5 mm. diametro, plus minusve sulcatis; foliis inter minora, ellipticis vel ovato-ellipticis, integerrimis, 6–9 cm. longis, 2.5–4 cm. latis, subcoriaceis, breviter subacute vel subobtusae acuminatis, basi rotundatis vel latissime acutis, in sicco haud verruculosus, supra brunneis, nitidis, subtus paullo pallidioribus; nervis primariis utrinque circiter 8, subpatulis, gracilibus, haud perspicuis, circiter ad marginem arcuato-anastomosantibus, reticulis laxis, obscuris; petiolo 7–10 mm. longo; inflorescentiis axillaribus, solitariis, pedunculo 2.5–3.5 cm. longo, floribus ad apice dense subcapitatim confertis capitulum 5–7 mm. diametro formanti-

bus, vel sursum dichotome ramosis, ramis binis 4–8 mm. longis singuli capitulum ferentibus; floribus sessilibus vel brevissime pedicellatis, confertis; sepalis suborbiculari-reniformibus, latissime rotundatis, circiter 1.5 mm. longis et 2 mm. latis; petalis fere liberis, ellipticis vel oblongo-ellipticis, sursum haud angustatis, apice late rotundatis, circiter 3 mm. longis et 1.5 mm. latis; staminibus haud visis; ovario ovoideo, glabro, stylo circiter 1 mm. longo; bracteis coriaceis, oblongo-ovatis, 1.5–1.8 mm. longis, acutis vel acuminatis, bracteolis similibus sed brevioribus.

INDO-CHINA, Langson Province, Massif du Mau Son, *Pételot* 1720, January 1925, altitude about 1200 m.

This species is remote from all of those admitted for Indo-China by Gagnepain, and is strongly characterized by its flowers being sessile or subsessile and crowded into small depressed-globose heads at the tip of the elongated simple peduncle, or arranged in two similar heads where the inflorescences are branched. The specimen is just beyond anthesis, but I was fortunate in finding in one of the heads a single flower from which it was possible to describe the petals; the stamens had fallen.

In connection with Gagnepain's interpretation of *Linociera cambodiana* Hance, it is suspected that he has included in his description some material that does not belong with Hance's species. Hance states that the leaves on his type were  $2\frac{1}{2}$  to 3 inches long; an examination of his type (*Pierre* from Phy Kok Island) in the British Museum herbarium shows them to vary from 6 to 11 cm. by 2 to 3.5 cm. Gagnepain describes the leaves as being 12 to 20 cm. long and 3 to 7 cm. wide.

#### GENTIANACEAE

*Gentiana cephalantha* Franch. in Hemsl. Jour. Linn. Soc. Bot. **26**: 125. 1890; Marq. Bot. Mag. **159**: t. 9468. 1936, Kew Bull. **1937**: 141. 1937.

INDO-CHINA, Tonkin, Chapa, Massif de Fan Tsi Pan, *Pételot* 3666, February 1929, alt. 1800 m. Szechuan, Yunnan, and northern Burma.

#### APOCYNACEAE

*Aganosma grandiflora* sp. nov.

Frutex scandens, ramulis junioribus inflorescentiisque exceptis glaber, ramis teretibus, glabris, subatris, ramulis ultimis 1.5–2 mm. diametro, conspersissime adpresse pubescentibus glabrescentibus; foliis oblongis vel oblongo-ellipticis, chartaceis, 5–7 cm. longis, 2–2.5 cm. latis, in sicco olivaceis, subnitidis, subtus paullo pallidioribus, breviter acute acuminatis, basi acutis vel late acutis, nervis primariis utrinque 10–12, gracilibus, haud perspicuis, obscure arcuato-anastomosantibus, reticulis subobsoletis; petiolo 5–6 mm. longo, glabro; inflorescentiis terminalibus, subcymosis, paucifloris (floribus 6–10), cum floribus magnis apertis, 8–10 cm. longis, 7–10 cm. latis, breviter pedunculatis vel e basi ramosis, plus minusve adpresse subcinereo-pubescentibus, ramis primariis paucis, subpatulis, ad 3 cm. longis; floribus albidis, circiter 4 cm. longis, pedicellatis; calycis lobis subpatulis, lanceolatis, acuminatis vel anguste acutis, circiter 12 mm. longis et 3.5 mm. latis, utrinque dense subcinereo-puberulis; corollae tubo extus puberulo, circiter 11 mm. longo, paullo supra basim leviter inflato et 4 mm. diametro, sursum angustato; lobis in partibus expositis puberulis et intus circa basim subhirsutis, ceteroquin glabris, circiter 2.5 cm. longis et 9–12 mm. latis,



obtusis vel subacutis, plus minusve inaequilateralibus; antheris lanceolatis, acuminatis, circiter 5 mm. longis; disco cylindrico, glabro, subcarnoso, crenato, circiter 1.5–2 mm. longo et 1.5 mm. diametro.

INDO-CHINA, Tonkin, near Than Moi, *Pételot* 2447, May 12, 1938, a liana growing on calcareous formations, flowers white.

A species characterized among its congeners, *Aganosma calycina* A. DC., *A. Schlechterianum* Lév. as interpreted by Tsiang (*Sunyatsenia* 4: 31, 1939), and allied species, by its large flowers, the corollas just before the petals spread being 2.5 cm. long. Among the Indo-Chinese species its alliance is with *A. Harmandiana* Pierre and *A. siamensis* Craib, but it is clearly distinct from both.

**Melodinus brachyphyllus** sp. nov.

Frutex scandens, magnus, ramulis inflorescentiis et foliis, praesertim subtus, molliter pubescentibus, ramis teretibus, subcastaneis, leviter pubescentibus, ramulis ultimis dense breviter pubescentibus, 1.5–2 mm. diametro; foliis parvis, ellipticis vel oblongo-ellipticis, coriaceis, 3.5–5 cm. longis, 1.5–2.5 cm. latis, breviter subobtusae acuminatis, basi acutis, supra olivaceis, subconspersae pubescentibus, subtus pallidioribus, dense molliter pubescentibus; nervis primariis utrinque 6–7, haud perspicuis, subtus leviter elevatis; petiolo pubescenti, 4–6 mm. longo; inflorescentiis terminalibus et in axillis superioribus, subcymosis, paucifloris, dense molliter pubescentibus, cum floribus 5–6 cm. longis, pedicellis 5–6 mm. longis, bracteis oblongo-lanceolatis, pubescentibus, 3–4 mm. longis, bracteolis binis, anguste oblongis, subobtusis, extus dense pubescentibus, ad 3 mm. longis, circiter 1 mm. latis; sepalis extus dense molliter pubescentibus, intus glabris, ellipticis vel oblongo-ellipticis, obtusis, 3.5–4 mm. longis, 1.8–2 mm. latis; corollae tubo cylindrico, 1.6 cm. longo, extus pubescenti (basi excepta), lobis subrhomboideis, circiter 1.5 cm. longis et 1 cm. latis, obtusis, deorsum angustatis, partibus expositis pubescentibus ceteroquin glabris; squamis 10, oblongis, plus minusve pubescentibus, circiter 1.5 mm. longis; antheris lanceolatis, acuminatis, 1.8 mm. longis, filamentis circiter 3–4 mm. supra basim tubi insertis, tubo hic haud inflato; ovario anguste ovoideo, glabro, stylo glabro, circiter 3 mm. longo.

INDO-CHINA, Langson Province, between Dong Mo and Than Moi, *Pételot* 2438, April 28, 1938, a large liana.

This species is characterized by its indumentum as well as by its unusually small leaves. It has the corolla throat scales ten, two opposite the base of each petal, thus falling in the group with *Melodorum erianthus* Pitard, but otherwise it is not closely allied to that species.

ASCLEPIADACEAE

**Gymnema alterniflorum** (Lour.) Merr. Trans. Am. Philos. Soc. II. 24(2): 318. 1935, cum syn.

*Apocynum alterniflorum* Lour. Fl. Cochinch. 168. 1790.

*Gymnema affine* Decaisne in DC. Prodr. 8: 622. 1844; Tsiang, *Sunyatsenia* 2: 196. 1934.

INDO-CHINA, Tonkin, Bac Giang Province, near Bo Ha, *Pételot* 2435, Nov. 6, 1938; Thoi Nguyen Province, route from Hanoi to Thoi Nguyen, *Pételot* 2421, Nov. 12, 1939, in thickets and hedges. Chekiang and Fokien to Formosa, Kwangtung, and Hainan.

*Gymnema formosanum* Warb. Repert. Sp. Nov. **3**: 307. 1907, type from Formosa, should be compared with this species.

**Toxocarpus Gagnepainii** Tsiang, Sunyatsenia **4**: 84. f. 26. 1939.

INDO-CHINA, Annam, Dalat, *Squires* 879. Known only from the type collection.

**Toxocarpus Klossii** S. Moore, Jour. Nat. Hist. Soc. Siam **4**: 149. 1921.

INDO-CHINA, Annam, Tour Cham, *Boden-Kloss*, herb. Brit. Mus. From the description a very different species than the preceding one.

**Toxocarpus ovalifolius** Tsiang, Sunyatsenia **2**: 193. t. 35. 1934.

INDO-CHINA, Tonkin, Bac Giang Province, near Bo Ha. *Pételot* 2434, Nov. 6, 1938. Previously known only from Hainan.

#### CONVOLVULACEAE

**Ipomoea cairica** (L.) Sweet, Hort. Brit. 287. 1827.

*Convolvulus cairicus* Linn. Syst. ed. 10. 922. 1759.

*Ipomoea palmata* Forsk. Fl. Aeg.-Arab. 43. 1775; C. B. Clarke in Hook. f. Fl. Brit. Ind. **4**: 214. 1883.

INDO-CHINA, Tonkin, Hanoi, *Pételot* 3673, Oct. 1924, in hedges.

Introduced here as it is in various other tropical countries, probably native of the Old World tropics.

**Erycibe subspicata** Wall. List. no. 1392. 1829, *nomen nudum*; G. Don, Gen. Syst. **4**: 392. 1838; C. B. Clarke in Hook. f. Fl. Brit. Ind. **4**: 181. 1883; Prain, Jour. As. Soc. Bengal **73**(2): 15. 1904, *in nota*.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 5972, 6605, Oct. 11, 1936, and Nov. 1, 1940, alt. 150–500 m.

These specimens are in all respects the same as *Henry* 12514, 12739, 13430 from Yunnan, determined by Prain, Jour. As. Soc. Bengal **73**(2): 15. 1904, *in nota* sub *Erycibe albiflora* Hall. f. as representing Wallich's species. Additional Yunnan specimens are *Wang* 79579, 80120, 80121, 80773, 80834 collected in 1935–36. Assam, Khasia, and Burma.

#### VERBENACEAE

**Callicarpa heterotricha** sp. nov.

Arbor 7–8 m. alta, ramulis ultimis 4–5 mm. diametro, densissime implicato-pubescentibus, pilis brevioribus numerosissimis substellatis, paucioribus intermixtis elongatis, depauperato-plumosis, subflaccidis, ad 3 mm. longis, indumento subferrugineo; foliis chartaceis, integris, obovatis vel oblongo-obovatis, acutis vel breviter acuminatis, basi acutis vel leviter decurrenti-acuminatis, 15–20 cm. longis, 6.5–10 cm. latis, supra olivaceis, ad costam nervosque dense pubescentibus, indumento ut in ramulis junioribus, parenchymate pilis sparsis brevibus stellatis vel depauperato-plumosis insperso, subtus pallidioribus sed haud albidis, ad costam nervosque densissime, in parenchymate manifeste sed haud dense stellato-pubescentibus, pilis superficiem haud occultantibus; nervis primariis utrinque 9–11, utrinque perspicuis, subtus elevatis, curvatis, ad marginem arcuato-anastomosantibus, reticulis primariis subparallelis; petiolo 1.5–2.5 cm. longo, indumento ut in ramulis junioribus; inflorescentiis multifloris, cymosis, pedunculatis, 8–12 cm. longis dense villosis, pilis stellatis et depauperato plumosis intermixtis; calycibus obovoideis, subtruncatis vel obscurissime 5-dentatis, extus dense pallide pubescentibus, circiter 1 mm. longis; corolla 3 mm. longa,

sursum ampliata, tubo 2 mm. longo, lobis 4, suborbiculari-obovatis, late rotundatis, 1 mm. longis; staminibus 4, filamentis gracilibus, glabris, longe exsertis, 6 mm. longis; antheris ellipsoideis, 1 mm. longis; ovario globoso, glabro, stylo quam filamentis paullo longiore.

INDO-CHINA, Tonkin, Sontoy Province, Mount Bavi, *Pételot* 2608, July 2, 1940, in humid forests, altitude about 600 m.

By Dr. Dop's key this falls with *Callicarpa arborea* Roxb. as interpreted by him, yet it differs from Roxburgh's species in so many striking characters, and for that matter all other Chinese and Indo-Malaysian species known to me, that I am constrained to describe it as new. The very dense indumentum on the branchlets, parts of the inflorescences, petioles, and on the midribs and lateral nerves on both surfaces of the leaves is made up of short crowded stellate hairs and much longer subplumose ones, the latter often 3 mm. in length, and usually with very few, short, lateral branchlets, these lateral branchlets scarcely stellate in arrangement. The shorter stellate hairs on the parenchyma on the lower surface by no means conceal the latter, the more or less scattered stellate hairs on other than the midrib and lateral nerves scarcely touching each other.

#### RUBIACEAE

*Hedyotis effusa* Hance, Jour. Bot. **17**: 11. 1879.

INDO-CHINA, Laos, Cammon Province, Pak Hin Boum, *Pételot* 2508, Dec. 1930. Southeastern China.

The material closely approximates a series of Kwangtung specimens representing Hance's species. I am unable to refer it to any of the Indo-Chinese species described by Pitard.

*Hedyotis tetragonalis* (Korth.) Walp. Ann. **2**: 769. 1852; Valetton, Bot. Jahrb. **44**: 543. 1912, *descr. ampl.*; Merr. & Metc. Lingnan Sci. Jour. **16**: 400. 1937.

*Diplophragma tetragonale* Korth. Nederl. Kruidk. Arch. **2**: 149. 1851.

*Hedyotis Parryi* Hance, Ann. Sci. Nat. IV. Bot. **18**: 221. 1862.

*Oldenlandia tetragonalis* Merr. Pap. Michigan Acad. **23**: 193. (1937) 1938.

*Oldenlandia subdivaricata* Drake, Jour. de Bot. **9**: 211. 1895; Pitard, in Lecomte, Fl. Gén. Indo-Chine **3**: 124. 1922, syn. nov.

*Hedyotis subdivaricata* Drake ex Pitard, l.c. in syn.

INDO-CHINA, Tonkin, Phuc Yen Province, Phu Lo and Phu Da Phuc, *Pételot* 2492, 2497, May and June 1936, in dry fallow rice paddies. Kwangtung and Hainan to Borneo and Sumatra.

I am unable to distinguish Drake's species from the forms described earlier by Korthals from Borneo and by Hance from Kwangtung Province, China.

*Hedyotis nigrescens* sp. nov. § *Diplophragma*.

Frutex, ramis teretibus, glabris, pallidis, ramulis ultimis subteretibus vel obscure 4-angulatis, subdense brevissime pubescentibus; foliis numerosis, oblongis vel oblongo-lanceolatis, 2-4 cm. longis, 5-10 mm. latis, breviter subapiculato-acuminatis, basi acutis vel subobtusis, sessilibus vel brevissime (1 mm.) petiolatis, chartaceis, supra in sicco nigrescentibus, glabris vel primo ad costam deorsum leviter pubescentibus, subtus paullo pallidioribus, brunneis, ad costam nervosque breviter pubescentibus, nervis primariis utrinque circiter 5, gracilibus, haud perspicuis, curvato-adscendentibus, ob-



scure arcuato-anastomosantibus, reticulis subobsoletis; stipulis laciniatis, extus leviter pubescentibus, 3–4 mm. longis, laciniis 5–10, gracilibus, interioribus longioribus, ad 2–2.5 mm. longis, exterioribus gradatim brevioribus; floribus 4-meris, fasciculatis, fasciculis terminalibus, haud pedunculatis, 6–10 mm. diametro, plerumque paucifloris; pedicellis glabris, ad 1 mm. longis; bracteolis 2 mm. longis, fimbriatis, membranaceis; floribus extus (sepalis exceptis) glabris, sepalis 4, lanceolatis, acuminatis, 2 mm. longis, quam capsulis longioribus, obscure brevissime hispidis; corollae tubo cylindrico, 2.5 mm. longo, 1 mm. diametro, intus sursum barbato, lobis 4, linearis vel anguste lineari-oblongis, recurvatis, 2 mm. longis, 0.5 mm. latis; filamentis brevibus, glabris, antheris circiter 1 mm. longis; stylo (basi apiceque exceptis) breviter pubescente, gracili, 4.5 mm. longo; stigmatibus 2, anguste oblongis, 1 mm. longis; capsulis glabris, obovoideo-globosis, ad 1.5 mm. longis, sepalis quam capsulis longioribus persistentibus, apicibus intra lobis haud protrusis, tarde loculicide dehiscentibus; seminibus numerosis.

INDO-CHINA, Tonkin, Langson Province, Thanh Moi, *Pételot 2521*, May 1938, in shrubby savannas.

A species with the general habit and much the appearance of the Philippine *Hedyotis Bartlingii* Merr., but with its persistent sepals distinctly longer than the glabrous, not pubescent, capsules.

***Ixora cephalophora***, sp. nov. § *Euixora*, *Chlamydanthus*.

Frutex glaber, ramulis ultimis circiter 3 mm. diametro, internodiis 5–7 cm. longis; foliis anguste oblongis vel oblongo-ob lanceolatis, chartaceis, apice obtusis vel breviter late obtuseque acuminatis, basi acutis, 20–25 cm. longis, 4–6.5 cm. latis, in sicco supra subolivaceis, nitidis, subtus paullo pallidioribus; nervis primariis utrinque circiter 10, gracilibus, curvatis, anastomosantibus, subtus elevatis, reticulis laxis; petiolo 1–2 cm. longo; stipulis suborbiculari-ovatis, circiter 5 mm. diametro, abrupte graciliter apiculatis, apiculis 3 mm. longis; inflorescentiis terminalibus, myrianthis, sessilibus, floribus densissime confertis, capitulum densum formantibus, circiter 7 cm. longis et 9 cm. latis, ramis primariis vix 1 cm. longis; floribus albidis, densissime confertis, in triadibus dispositis, lateralibus brevissime (1–2 mm.) pedicellatis, medianis sessilibus; bracteolis submembranaceis, lanceolatis, acuminatis, 2.5–4 mm. longis, 1.5 mm. latis, quam calycis tubo multo longioribus; calycis tubo circiter 2 mm. longo, lobis submembranaceis, oblongo-lanceolatis vel lanceolatis, acuminatis, 4–5 mm. longis, 2 mm. latis; corollae tubo gracili, 2 cm. longo, lobis 4, ellipticis, intus glabris, rotundatis, 6 mm. longis et 4 mm. latis; filamentis brevissimis, antheris anguste oblongis, 3 mm. longis; stylo gracili glabro.

INDO-CHINA, Tonkin, Langson Province, Thanh Moi, *Pételot 2502*, April 28, 1938, a shrub with white flowers in shrubby savannas.

A strongly marked species, characterized by its dense, terminal, sessile, globose heads of very numerous flowers, the primary branches of the inflorescence being greatly shortened, the branches and very short branchlets densely crowded, the lanceolate bracteoles and sepals much longer than the calyx tubes. Its alliance is clearly with *Ixora multibracteata* Pearson of Burma, Siam, the Malay Peninsula, and Sumatra. Judging from Bremekamp's description, *Ixora capituliflora* Bremek. Jour. Bot. **75**: 297. 1937, is also closely allied to this Indo-Chinese form.

***Ixora flexilis*** Pierre ex Pitard in Lecomte, Fl. Gén. Indo-Chine **3**: 315. 1924, *in syn.*  
*Ixora diversifolia* Wall. var. *flexilis* Pitard, l.c. descr.

INDO-CHINE, Tonkin, Bac Giang Province, Pho Vi, *Pételot* 2490, June 3, 1936, in humid forests.

As *Ixora diversifolia* R. Br. is interpreted by Bremekamp, Jour. Bot. **75**: 321. 1937, and as he in general limits species, I see no reason why the Indo-Chinese form with very short pubescent inflorescences and slightly pubescent corollas, the form figured by Pierre in his lithographed dissections of *Ixora flexilis* Pierre, should be placed with *Ixora diversifolia* R. Br. as a variety as Pitard did.

***Myrioneuron effusum*** (Pitard) comb. nov.

*Myrioneuron nutans* Wall. var. *effusa* Pitard in Lecomte Fl. Gén. Indo-Chine **3**: 192. 1923.

A second collection of this species from the type locality, Mount Bavi, *Pételot* 2520, in flower, seems to justify the proposal of this form as a species: Balansa's specimen, on which Pitard's ample description was based, was in fruit. The flowers are about 14 mm. long. Calyx tube about 3 mm. long, the lobes lanceolate, long and slenderly acuminate, at anthesis 6–7 mm. long, in young fruit 1 cm. long, more or less pubescent outside. Corolla tube cylindric, 1 cm. long, the lobes oblong-ovate, acute, 2 mm. long, these and the tube short-pubescent outside, the tube villous within. Filaments glabrous, 1.5 mm. long, the anthers linear-lanceolate, 3 mm. long, their tips slightly exerted. Style arm 4 mm. long.

***Psychotria siamica*** (Craib) Hutch. in Sargent, Pl. Wils. **3**: 415. 1916.

*Cephaelis siamica* Craib, Kew Bull. **1911**: 395. 1911.

*Psychotria Thorelii* Pitard in Lecomte, Fl. Gén. Indo-Chine **3**: 364. 1934, *syn. nov.*

Pitard's type was from Paklai, Laos, Indo-China, a specimen collected by *Thorel* that I have not seen. This strongly marked species is clearly represented by *Pételot* 2516 from Langson Province, and 5713 from Thai Nguyen Province, Tonkin. I can detect no constant differences between *Psychotria Thorelii* Pitard and the earlier *P. siamica* (Craib) Hutch. The species extends from Siam to Indo-China, Yunnan, and Kwangsi.

***Spiradielis caespitosa*** Blume, Bijdr. 795. 1826; Kurz, Jour. As. Soc. Bengal **46**(2): 129. 1877; Hook. f. Fl. Brit. Ind. **3**: 76. 1880.

INDO-CHINA, Tonkin, Massif de Pia Quac, near Nam Kep, *Pételot* 713, July 1922, on schistose cliffs, alt. 700 m. Java and Martaban.

This specimen agrees with the inadequate descriptions of Blume's species and probably represents it; the type was from Java and I have seen no specimens representing the species. Hooker f. admits it on the basis of Kurz's Martaban record, but no species of the genus has been recorded from either Siam or the Malay Peninsula.

***Spiradielis leptobotrya*** (Drake) Pitard, var. ***longiflora*** var. nov.

A typo (haud viso) differt floribus distincte longioribus, circiter 5 mm. longis, corollae tubo 4 mm. longo, lobis 1.3 mm. longis, petiolis paullo longioribus, (ad 2.5–3 cm.) ramulis compressis vel sulcatis, haud 4-angulatis.

INDO-CHINA, Tonkin, Hoa Binh Province, Muong Thon, route from Hanoi to Hoa Binh, *Pételot* 6405, Oct. 1937, in open forests.

Pitard's ample and detailed description applies rather well to the cited specimen except in the characters indicated. The type is *Balansa* 2635 from Cho-bo, Tonkin. The corolla lobes are described as 0.3–0.4 mm. and the tube as 1.5–2 mm. long, the form I have indicated as var. *longiflora* having flowers twice as long. Pitard's figure, 9, 7–9, includes an illustration of a mature flower, and he describes and illustrates the corolla as pubescent outside, although in Drake's original description it is indicated as glabrous. The species is known only from the original collection.

## CAPRIFOLIACEAE

***Viburnum erubescens*** Wall. var. ***neurophyllum*** Hand.-Maz. Symb. Sin. **7**: 1033. 1936.

INDO-CHINA, Tonkin, Bac Giang Province, Lang Met, *Pételot* 1814, May 1925. The variety in Yunnan, the species extending from the Himalayan region to Ceylon, Yunnan, and Szechuan.

## VALERIANACEAE

***Valeriana Jatamansi*** Jones, As. Res. **2**: 405, 416. 1790; Hand.-Maz. Act. Hort. Gothob. **9**: 171. 1934.

INDO-CHINA, Tonkin, Chapa, Massif de Song ta Van, *Pételot* 2096, April 1936, in open forests, alt. 1900 m. Himalayan region to Yunnan, Szechuan, and Hupeh.

When first studied, this number and *Pételot* 5934, described below as var. *glabra*, were indicated as representing a new species. I am now convinced that it cannot be separated from the rather widely distributed *Valeriana Jatamansi* Jones, synonyms of which are *V. spica* Vahl (1806), *V. Wallichii* DC. (1832), *V. Harmsii* Graebn. (1898), and *V. Mairei* Briq. (1914). The indumentum on this specimen is like that on typical Asiatic material of Jones' species, but the leaves are rather distinctly undulate-crenate or even crenate-dentate.

Var. ***glabra***, var. nov.

A typo differt partibus omnibus glaberrimis, foliis irregulariter sat grosse crenato-dentatis.

INDO-CHINA, Tonkin, Chapa, Lo Qui Ho to Ta Pinh, *Pételot* 5934, April 1936, along the trail near a cascade, alt. 1700 m.

The only species hitherto recorded from Indo-China is the very different *Valeriana Hardwickii* Wall.

## CUCURBITACEAE

***Alsomitra integrifoliola*** (Cogn.) Hayata, Jour. Col. Sci. Univ. Tokyo **30**(1): 121. 1911; Ic. Pl. Formos. **1**: t. 38–39. 1911, **2**: 40. 1912; Cogn. Pflanzenr. **66** (IV. 275<sup>1</sup>): 17. 1916.

*Gynostemma integrifoliolum* Cogn. in DC. Monog. Phan. **3**: 916. 1881.

*Gynostemma elongatum* Merr. Philip. Jour. Sci. **3**: Bot. 267. 1908.

*Hemsleya elongata* Cogn. Pflanzenr. **66**(IV. 275<sup>1</sup>): 26. 1916.

*Alsomitra tonkinensis* Gagnep. Bull. Mus. Hist. Nat. Paris **24**: 372. 1918; Lecomte, Fl. Gén. Indo-Chine **2**: 1088. f. 126. 1921.

INDO-CHINA, Tonkin, Ninh Binh Province, Cho Ganh, *Pételot* 1198, November 1923. Philippines, Formosa, and Hainan.

Cogniaux erroneously excluded *Gynostemma integrifoliolum* Cogn. as a synonym of *Alsomitra integrifoliola* Hayata. In Philip. Jour. Sci. **7**: Bot.



353. 1912, I called attention to the fact that *Gynostemma elongatum* Merr. is a synonym of *Alsomitra integrifoliola* Hayata and that the "fruits" of *Gynostemma integrifoliolum* Cogn. as described by Cogniaux were merely globose galls infested with insect larvae. Although I have seen no authentic material representing *Alsomitra tonkinensis* Gagnep., I do not see how this can be distinguished from *A. integrifoliola* (Cogn.) Hayata from the published data appertaining to Gagnepain's species.

## COMPOSITAE

**Cirsium involucratum** DC. Prodr. **7**: 639. 1837.

*Cnicus involucratus* Wall. ex DC. l.c. *in syn.*; Clarke in Hook. f. Fl. Brit. Ind. **3**: 362. 1881.

INDO-CHINA, Tonkin, Chapa, *Pételot* 6289, July 1935, a coarse herb 2-2.5 m. high, alt. 1500 m. Himalayan region to Yunnan, if I have correctly determined *Henry* 9083 and *Forrest* 15153.

Gagnepain admits three species of *Cnicus* as occurring in Indo-China, *C. japonicus* Max., *C. Leducii* Franch., and *C. chinensis* Maxim., this record adding a fourth species to the general group.

**Eupatorium odoratum** Linn. Syst. ed. 10. 1205. 1759; Gagnep. in Lecomte, Fl. Gén.

Indo-Chine **3**: 506. 1924; Kerr in Craib, Fl. Siam. Enum. **2**: 249. 1936.

This tropical American species was included by Gagnepain on the basis of Siam collections, but he had no material from Indo-China. Kerr, however, speaks of it as now widely distributed in Assam, Burma, Siam, the Malay Peninsula, and French Indo-China. It has recently been collected along roads at Co Dong, Sontoy Province, Tonkin, and the collector mentions it as of probably recent introduction and as rapidly spreading, *Pételot* 2063, December 1935.

**Youngia cineripappa** (Babc.) Babc. & Stebb. Gen. Youngia 60. f. 13. 1937. (Carnegie Inst. Washington Publ. **484**).

*Crepis cineripappa* Babc. Univ. Calif. Publ. Bot. **14**: 325. 1928.

*Crepis primulifolia* Hook. f. Gen. Pl. **2**(1): 514. 1873, *nomen nudum*.

INDO-CHINA, Tonkin, Chapa, *Pételot* 2060 (det. Babcock) 6541, April 1925 and 1935, alt. 1500 m. Assam, Khasia, Yunnan, Szechuan, and probably Kweichow.

In recognizing *Youngia* as a generic segregate from *Crepis*, Babcock and Stebbins cite *Pételot* 1762 from Chapa as representing this species. *Crepis japonica* (Thunb.) Benth., a widely distributed weed also occurring in Indo-China (Fl. Gén. Indo-Chine **3**: 642. 1924), becomes *Youngia japonica* (Thunb.) DC.; Babc. & Stebb. op. cit. 94. f. 28. 1937.

ARNOLD ARBORETUM,

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## THE VEGETATIVE PROPAGATION OF EASTERN WHITE PINE AND OTHER FIVE-NEEDED PINES<sup>1</sup>

CARL G. DEUBER

*With one plate*

WITH the recognition of the root-inducing properties of heteroauxin and a number of chemicals with similar physiological activity, a new interest in vegetative propagation of forest trees was stimulated. This has resulted in studies of root regeneration in cuttings of species heretofore reproduced only by seed and whose ability to form roots from stem pieces was little known. With at least one conifer, *Pinus radiata* Don (11), large nursery operations are in progress with the reproduction of superior stock by means of stem cuttings. In the United States and Canada considerable study has been given the rooting characteristics of eastern white pine (2, 3, 5, 6, 14, 17 and 23). These investigations have clarified a number of features of the root regeneration characteristics of eastern white pine cuttings, but have not progressed to a point where extensive propagation programs could be started with confidence that consistent and abundant rooting would result.

The cuttings of this species have been found to be relatively difficult to root. They root most readily when secured from very young seedlings, but in a very irregular manner or not at all when obtained from older trees. Applications of root-inducing chemicals usually hastened and increased the rooting of cuttings from seedlings, but have not given consistently beneficial results with those from older trees. Considerable periods of time are required for roots to form on cuttings from older trees. With dormant cuttings the period may be three to five months or more. In the propagating bench many cuttings die from drying out and they are very subject to decay. The rooting of white pine stem cuttings is still considered to be in an experimental stage requiring many additional facts as well as confirmation of previous findings to make vegetative propagation a reliable procedure in silviculture, in tree breeding or in forest pathology programs.

The present study deals with the rooting responses of many collections of eastern white pine cuttings and a lesser number from seven additional species of five-needled pines: *Pinus monticola*, *P. parviflora*, *P. flexilis*, *P. koraiensis*, *P. peuce*, *P. Cembra* and *P. Lambertiana*. The influence of the age of the parent trees from which the cuttings were obtained was

<sup>1</sup>The experimental work was conducted at the Harvard Biological Laboratories and the Arnold Arboretum of Harvard University while the writer was in residence in 1940-41. Acknowledgement of thanks are extended to Professor A. B. Dawson and Professor K. V. Thimann for laboratory facilities and to Professor E. D. Merrill for the privilege of collecting material from the conifer collections in the Arnold Arboretum.

observed with shoots taken from trees 2 to 90 years old. Cuttings were collected from a number of plantations and the rooting responses of the cuttings of a number of individual trees were recorded. It has been previously observed (3) that considerable inherent variability in the ability of cuttings from certain individual trees to root may exist, so that any light upon associated characters of those trees which yield cuttings which root would be exceedingly useful. A very extensive series of auxin treatments was applied to the cuttings as well as trials of the effectiveness of treatments with sucrose and nitrogenous compounds. Observations on the influence of fungicides and dormancy-breaking chemicals were also made.

#### GENERAL METHODS OF PROCEDURE

The cuttings were collected in nurseries and plantations in Connecticut and Massachusetts, in the Arnold Arboretum of Harvard University, and one collection of white pine branches came from Wisconsin and one of sugar pine from California. In general, only lateral shoots of the current season's growth were taken from lower lateral branches. The cuttings were made to a length of 3 to 4 inches with snap-cut pruning shears. The propagating medium was fresh medium coarse sand in open central benches in warm greenhouses. One bench was equipped with electric coil heating units set to provide a temperature of 70° F. in the sand. Cheesecloth shades were provided to reduce the intensity of direct sunlight. The propagation conditions were excellent for cuttings that rooted readily and they permitted satisfactory survival of many collections of cuttings of adult pine trees for periods of five to eight months. The rooting responses of the cuttings were first inspected after they had been in the sand between two and three months.

#### ROOTING RESPONSES OF CUTTINGS FROM SEEDLINGS AND TRANSPLANTS

For some time it has been recognized that cuttings from seedlings of many trees root more readily than those from adult trees. Stoutemeyer (22) reviewed this subject in connection with a study of root formation in apple cuttings. The significance of the age factor to ease of rooting was shown to hold for various species, including eastern white pine, by Gardner (7). Thimann and Delisle (23) obtained rooting with cuttings of eastern white pine seedlings  $\frac{1}{2}$  to 3 and 4 years old. Deuber (3) found that cuttings from eastern white pine seedlings 2 to 4 years old rooted most abundantly, those from trees 5 and 7 years rooted much less and those from trees 15, 25, 35 and 60 years old rooted in a very irregular manner. With cuttings from trees 5, 10, 15, 20 and 40 years old Snow (17) reported rooting with those from the three younger ages. It was hoped that additional study of the conditions required for the rooting of cuttings from young pines would result in more consistently high rooting responses and would shed light upon the procedures most suitable for cuttings from older trees.

In the present investigation the most complete series of cuttings from trees 2 to 7 years old from the same source and handled uniformly were



supplied by Mr. J. R. Brubaker of the Cheshire Nursery, Cheshire, Conn. One-half of the cuttings were treated with indolebutyric acid in talc (2 mg./gm.) just before being planted in mid-January. A second auxin treatment was given the non-rooted cuttings at the time of the first inspection. The data recorded in Table 1 give the progress in root formation at three periods during the six months the cuttings remained in the propagating bench. A series of typical rooted cuttings is illustrated in Plate 1.

TABLE 1.

ROOTING RESPONSES OF EASTERN WHITE PINE CUTTINGS FROM NURSERY STOCK 2 TO 7 YEARS OLD. PLANTED JAN. 13, 1941.

Type of shoot	Age of trees, Treatment	No. per group	Rooted after:		
			73 days	134 days	182 days
			%	%	%
	2 years				
Terminal.....	Control	36	2.7	38.8	41.7
Terminal.....	I.B. in talc	36	50.0	61.1	63.9
	3 years				
Terminal.....	Control	18	33.3	55.5	55.5
Terminal.....	I.B. in talc	18	50.0	61.1	72.2
Lateral.....	Control	40	15.0	62.5	67.5
Lateral.....	I.B. in talc	40	45.0	45.0	52.5
	4 years				
Branch terminal.....	Control	20	10.0	10.0	10.0
Lateral, upper whorl.....	Control	30	3.3	26.6	43.3
Lateral, lower whorl.....	Control	36	19.4	58.3	86.1
	5 years				
Branch terminal.....	Control	20	0	0	0
Lateral.....	Control	30	0	3.3	23.3
Lateral.....	I.B. in talc	30	3.3	23.3	43.3
	6 years				
Branch terminal.....	Control	20	0	10.0	10.0
Lateral.....	Control	30	0	6.6	40.0
Lateral.....	I.B. in talc	30	13.3	43.3	63.3
	7 years				
Branch terminal.....	Control	20	0	0	0
Lateral.....	Control	28	0	0	3.5
Lateral.....	I.B. in talc	28	0	7.1	28.5

The terminal shoots of 2- and 3-year old seedlings rooted satisfactorily, but the branch terminals of lateral branches from transplants 4 to 7 years old rooted very poorly or not at all. Another significant difference in the rooting responses between two types of cuttings was that between upper and lower whorl lateral shoots of 4-year old trees. Cuttings from the upper whorl of branches rooted 43.3 per cent and those from the lower whorl 86.1 per cent.

The cuttings from 3-year old seedlings were the most prompt in rooting. With cuttings of lateral shoots, sharply graduated decreases in rooting responses between cuttings from seedlings 2 to 6 years old did not occur. The rooting of cuttings from 7-year old transplants decreased markedly from those of the younger ages.

The auxin treatment of the cuttings both hastened root formation and increased the number that rooted in all but one instance, laterals of 3-year old stock. The most marked effect of the auxin treatments was with the 7-year old stock which rooted 3.5 per cent without treatment and 28.5 per cent when treated. Calculation of the  $\chi^2$  value for all the control groups compared with the auxin treated groups indicated that the influence of the auxin treatments was highly significant.

#### TESTS OF VARIOUS METHODS FOR TREATING THE CUTTINGS

At the end of March a large collection of cuttings was made from 6-year old seedlings growing in an old field. A variety of auxin treatments that had been tried with cuttings from adult trees was tested together with the influence of sucrose. These treatments and the rooting responses are recorded in Table 2. Most of the cuttings were pulled from the branches with a quick jerk so that a small heel of the bark of the previous season's growth remained attached to the stem bases. This method of preparing the cuttings was compared with cutting them off with a razor blade at the base of the current season's growth. The untreated control groups rooted 25 per cent when the cuttings were removed with a razor and 30 per cent when pulled off with a heel. A larger difference in favor of the cuttings with a heel was found when the cuttings were treated with indolebutyric acid in talc. Treatment of the cuttings with indolebutyric acid or  $\alpha$ -naphthaleneacetic acid in talc dusts were of the same order of effectiveness in increasing the rooting of the cuttings above that of the controls. These treatments were particularly effective in hastening root formation.

Maximum rooting was secured when the cutting bases were placed in a solution of indolebutyric acid, 10 mg./l., for 3 hours. A similar treatment with  $\alpha$ -naphthaleneacetic acid was just one-half as effective in inducing rooting. When the cuttings were placed in a 1.5 per cent solution of sucrose for 3 hours the rooting response was of the same order, 50 per cent, as the best treatment with indolebutyric acid in talc.

Solutions of auxins and sucrose were also employed with a modification of the vacuum method described by Butterfield and McClintock (1). Earlier trials in which pine cuttings were subjected to a vacuum in the presence of a solution of auxin did not prove satisfactory, nor did trials in which the cuttings were first subjected to a vacuum and then to pressure. In this experiment the cuttings were placed in a suction flask with auxin or sucrose solutions and a pressure of 1 atmosphere was applied from a cylinder of compressed nitrogen gas for 10 or 20 minutes. The pressure method for a 10-minute period was approximately as effective as the method in which cuttings stood in solutions of indolebutyric acid or

sucrose for 3 hours. When the cuttings were treated with a solution containing both indolebutyric acid and sucrose the rooting response was of the same order as that of the controls. This result occurred in both the static and pressure methods of treatment.

TABLE 2.

THE INFLUENCE OF VARIOUS TREATMENTS UPON THE ROOTING RESPONSES OF CUTTINGS OF EASTERN WHITE PINE TREES 6 YEARS OLD. PLANTED MARCH 30, 1941.

Type of shoot and Treatment	No. per group	Rooted after:	
		60 days	140 days
		%	%
Lateral shoots			
Control, pulled off with a heel	20	0	30.0
Control, cut with a razor	20	0	25.0
I.B. in talc, 2 mg./gm., pulled off with a heel	20	45.0	50.0
I.B. in talc, 2 mg./gm., cut with a razor	20	20.0	35.0
(Cuttings of remaining groups pulled off with a heel)			
Nap. in talc, 2 mg./gm.	20	45.0	45.0
I.B. in soln., 10 mg./l., 3 hrs.	20	15.0	60.0
I.B. in soln., 10 mg./l., with pressure, 10 min.	20	0	55.0
I.B. in soln., 10 mg./l., with pressure, 20 min.	20	5.0	35.0
Nap. in soln., 10 mg./l., 3 hrs.	20	10.0	30.0
Sucrose, 1.5% soln., 3 hrs.	20	5.0	50.0
Sucrose, 1.5% soln., with pressure, 10 min.	20	0	45.0
I.B. soln., 10 mg./l. + sucrose, 1.5% soln., 3 hrs.	20	0	35.0
I.B. soln., 10 mg./l. + sucrose, 1.5% soln., pres. 10 min.	20	0	25.0
I.B. in lanolin paste, 4 mg./gm., to stem bases	20	0	0
I.B. in lanolin emulsion, 0.2 mg./ml., to stem bases	20	0	0
I.B. in lanolin emulsion, 0.2 mg./ml., to buds	20	0	10.0
I.B. in lanolin emulsion to stem bases and to buds	20	0	5.0
Branch terminal shoots			
Control	20	0	0
Toothpicks saturated with 95% alcohol	20	5	5.0
Toothpicks saturated with I.B. in alc., 10 mg./10 ml.	20	30.0	55.0
Toothpicks saturated with Nap. in alc., 10 mg./10 ml.	20	60.0	85.0

Application of indolebutyric acid in lanolin paste induced injury and early decay of the cutting bases. An emulsion of lanolin with indolebutyric acid prepared like colchicine emulsions, Warmke and Blakeslee (25), while not as injurious as lanolin paste, was not effective when applied to the stem bases, buds, or to both the stems and buds.

The large terminal shoots of lateral branches were induced to root and in relatively high percentages when sharpened ends of toothpicks previously soaked in concentrated alcoholic solutions of indolebutyric acid or  $\alpha$ -naphthaleneacetic acid were inserted into the stems just above the base. This



technique was described by Romberg and Smith (15) for the thick root cuttings of pecan. The work of Snow (17) and other investigators of eastern white pine propagation have shown that lateral shoots root so much more readily than branch terminals on all but the youngest seedlings that branch terminal shoots were only rarely used in this investigation. The magnitudes of the rooting responses were such that additional study of the method is warranted.

The data of this experiment with cuttings of 6-year old trees afforded the best opportunity in this investigation to compare the effectiveness of various methods of treatment with auxins and sucrose. A favorable circumstance was the fact that the control cuttings had an inherent ability to root. Both dust and solution treatments with indolebutyric acid increased rooting; the dust applications with indolebutyric acid or  $\alpha$ -naphthaleneacetic acid hastened root formation more than solution treatments. No particular advantage can be ascribed to the pressure method, its brevity being counterbalanced by the additional equipment necessary, and with a period longer than 10 minutes the results were not satisfactory. Why sucrose and indolebutyric acid used separately were effective but when combined did not increase rooting is not known. Treatments with lanolin paste and lanolin emulsion did not prove satisfactory. The results with toothpicks saturated with auxin solutions for branch terminals were particularly effective.

#### RESULTS WITH CUTTINGS FROM TREES 8 TO 90 YEARS OLD

From November through April twenty-four collections of cuttings were secured from eastern white pine trees of intermediate and adult age classes. The trees from which the cuttings were made grew in well established plantations making vigorous growth or from suppressed trees, isolated mature trees, trees trained as hedges by annual trimming, or trees transplanted during the previous two or four years. The cuttings were treated with auxins in various ways, with sucrose and solutions of nitrogenous compounds. Since the rooting responses were generally highly irregular, with no rooting occurring in many groups of cuttings, the data have been condensed by omitting the majority of the negative results in Table 3. The total number of cuttings in each experiment and test group is indicated to give the scale of the test together with the rooting percentages of all the control groups and for the treated groups in which rooting occurred.

With the exception of collections of cuttings from trees 15 years old, irregular rooting and in relatively low percentages or complete failure to root characterized these data. While low rooting was more pronounced in cuttings from trees above 15 years old, those from trees 8 to 12 years old also rooted in an irregular manner. Some rooting did occur in cuttings from trees 8, 10, 12, 15, 16, 38 and 61 years old. These responses do indicate that all ability to regenerate roots is not lost in the shoots from older trees and requires additional search for the factors responsible. A

TABLE 3.

ROOTING RESPONSES OF CUTTINGS FROM EASTERN WHITE PINE TREES 8 TO 90 YEARS OLD. DATA FOR THE CONTROL GROUPS OF CUTTINGS AND ONLY THOSE OF THE TREATED GROUPS IN WHICH ROOTING OCCURRED.

Expt. No.	Age of trees and Treatment	Total No. cuttings	No. per group	Rooted %
8 years				
32	Control .....	600	30	3.3
	Toothpicks saturated with I.B. soln. ....		30	10.0
	I.B. in lanolin paste .....		30	6.6
	I.B. soln., 10 mg./l. + sucrose 1.5%, 4 hrs. ....		30	3.3
	I.B. soln., 100 mg./l. + sucrose 1.5%, 4 hrs. ....		30	3.3
10 years				
37	Control .....	260	20	0
	Nap. in talc, 2 mg./gm. ....		20	5.0
	I.B. soln., 10 mg./l., pressure 10 min. ....		20	25.0
	I.B. in lanolin paste .....		20	5.0
12 years				
27	Control .....	180	20	5.0
	Toothpicks saturated with I.B. soln. ....		20	5.0
15 years				
12	Control .....	178	24	33.3
	I.B. in talc, 2 mg./gm. ....		24	20.8
29	Control .....	270	30	36.6
	Control, pulled off with a heel .....		30	40.0
	I.B. in talc, 2 mg./gm., cut with shears .....		30	56.6
	I.B. in talc, 2 mg./gm., pulled off with heel .....		30	60.0
	I.B. in lanolin paste, cut with shears .....		30	23.3
	I.B. in lanolin paste, pulled off with a heel .....		30	6.6
	I.B. in lanolin emulsion, cut with shears .....		30	16.6
	I.B. in lanolin emulsion, pulled off with heel .....		30	13.3
16 years				
13	Control .....	100	50	0
24	Control .....	380	20	0
	I.B. soln., 10 mg./l., pressure 20 min. ....		30	16.6
36	Control .....	80	20	0
	I.B. in talc, 2 mg./gm. ....		20	10.0
	Nap. in talc, 2 mg./gm. ....		20	5.0
18 years				
13	Control .....	460	50	0
31	Control .....	440	20	0
40	Control .....	90	30	0

TABLE 3 (continued)

Expt. No.	Age of trees and Treatment	Total No. cuttings	No. per group	Rooted %
20 years				
6	Control.....	80	20	0
	I.B. in talc, 2 mg./gm.....		20	5.0
	I.B. soln., 200 mg./l., 2 hrs.....		20	5.0
38	Control.....	180	20	0
12	Control.....	60	20	0
26 years				
27	Control.....	360	20	0
41	Control.....	100	20	0
15 to 35 years				
17	Control, a group from 1 tree.....	518	30	3.3
	I.B. in talc, 2 mg./gm., 4 groups of 4 trees.....		30	6.6
	I.B. in talc, 2 mg./gm., 4 groups of 4 trees.....		30	10.0
38 years				
13	Control.....	500	50	10.0
61 years				
10	Control.....	132	20	0
	I.B. in talc, 2 mg./gm.....		20	5.0
13	Control.....	50	50	0
27	Control.....	160	20	0
38	Control.....	100	20	0
67 years				
11	Control.....	100	20	0
25	Control.....	100	20	0
90 years				
13	Control.....	50	25	0

feature which aided understanding of irregular rooting of Norway spruce and eastern white pine cuttings in a previous study, Deuber (3), was a high degree of variability in the inherent ability of cuttings from individual trees to root. This has been termed 'clonal variation' in ability to root. Some evidence also indicates that ability to root may be associated with the vigor of growth of the parent tree or shoots from which the cutting is made, suppressed and weakly growing trees at times yielding cuttings that root more readily than those from vigorous trees.

In the present experiments the cuttings from the younger trees 8 to 12 years old were random samples from stock growing vigorously. In but one



group was the rooting response above 10 per cent. One solution treatment with indolebutyric acid did cause one group of cuttings from 10-year old trees to root 25 per cent.

With two collections from trees 15 years old and three from trees 16 years old, fairly consistent rooting occurred in one, Experiment 29. The cuttings of this experiment were from four suppressed trees 15 years old growing in an open stand of oaks. The rooting responses of the cuttings from each of the four trees were not recorded separately, but from the consistency of rooting in eight of the nine groups of cuttings it is probable that each of these trees yielded cuttings with ability to root. Of the 270 cuttings planted, 76 or 27.7 per cent rooted within 158 days. The control groups rooted 36.6 and 40 per cent respectively, and two groups treated with auxin rooted 56.6 and 60 per cent.

In the second test with cuttings of 15-year old trees, Experiment 12, the cuttings were from four moderately vigorous trees. The rooting recorded was with cuttings from but one of the four trees. Low rooting was again found with cuttings from two very vigorous trees 16 years old in Experiment 36.

The two additional collections of cuttings from 16-year old trees, Experiments 13 and 24, were random samples from a clipped hedge. Also, in Experiments 27 and 41, cuttings were obtained from another hedge composed of trees 26 years old. These hedges were long established, and close planting probably introduced serious root competition. It was desired to determine if annual pruning with consequent stimulation of new shoot formation brought about a physiological rejuvenation of these shoots with increased ability to regenerate roots. The results were definite in showing that root formation was not favorably influenced. Although a total of 940 cuttings from the two hedges were planted and given a variety of treatments with auxins, no rooting resulted. Survival of these cuttings was inferior to those from normal trees of the same age classes.

Only a limited demonstration of clonal variation in ability to root was found with cuttings secured from 38 individual trees 15 to 38 years old in Experiments 13 and 17. Ten vigorous trees 18 years old did not yield cuttings that rooted although in the previous year eight of these trees gave cuttings that rooted 5 to 20 per cent. Of ten moderately vigorous trees 38 years old, the cuttings from only one tree rooted. Professor A. J. Riker of the University of Wisconsin supplied the writer with branches of 18 trees selected for the resistance these trees were exhibiting to white pine blister rust. The trees varied in vigor and were 15 to 35 years old. Cuttings from this material received in January survived very well in the propagating bench but were very slow in starting to root. When first dug and inspected after 83 days they were treated with indolebutyric acid in talc. The first rooting of these cuttings was detected after they had been planted 188 days. One cutting had rooted from a tree 20 years old and another from a tree 34 years old. By September 26 or 260 days from planting, one to three cuttings had rooted in the groups from nine trees. The shoot

growth of eight of these trees was classed as vigorous or moderately vigorous and of one as weakly vigorous.

A 60-year old tree sampled at various times in 1940 yielded cuttings that rooted 10 to 30 per cent. In four collections from this tree in the present study but one cutting rooted, Experiment 10. Two trees 67 and 90 years old gave no cuttings that rooted.

#### INFLUENCE OF VARIOUS TREATMENTS UPON THE CUTTINGS OF OLDER STOCK

Numerous tests were made of the effectiveness of treatments with auxins and sucrose of the cuttings of the intermediate and adult trees together with several tests with nitrogenous compounds. The number and variety of these tests is not adequately shown in Table 3 because they were usually not effective when rooting failed to occur in the control cuttings. In other than the results of Experiment 29, with cuttings from trees 15 years old, the rooting responses were too irregular to make comparisons between the effectiveness of the auxin treatments except indications of survival, callus formation or injury.

In Experiment 29, treatment of the cuttings with indolebutyric acid in talc induced an increase in rooting above that secured in the control groups. This method was definitely superior to applying auxin in a lanolin paste or emulsion. Many instances of injury or early decay of the cutting bases were found with the paste applications and the emulsion applications were only rarely effective.

While a number of trials with auxins in aqueous solutions containing 10, 100 or 200 mg./l. of the auxin for periods of 2 to 18 hours were made as well as tests of the pressure method previously described, no consistent improvement in the rooting responses were recorded. Doran *et al.* (5) reported one unusually good result with cuttings of 30-year old white pine trees treated with a high concentration of indolebutyric acid in solution for five hours. Similar treatment of cuttings in this investigation did not prove effective. It is quite possible that considerable variation exists in the manner in which cuttings from different trees respond to auxin treatments.

Toothpicks saturated with alcoholic solutions of auxins, while effective with branch terminal shoots of young stock, rarely induced the rooting of cuttings from older trees. In a number of cases severe chemical injury to the stem tissues at the point of insertion resulted.

When the cuttings were placed in a 1.5 per cent solution of sucrose alone or in combination with indolebutyric acid, rooting was not increased. In a few instances callus formation appeared to be favored by treatment with sucrose.

Several investigators have found that treatment of cuttings with solutions of nitrogenous compounds or a nutrient solution increased rooting. Doak (4) found solutions of certain amino acids and inorganic nitrogen compounds to aid the rooting of rhododendron cuttings, and Grace (8) secured increases in the rooting of Norway spruce cuttings by supplying

a complete nutrient solution to the sand during propagation. In two experiments with eastern white pine cuttings, the cuttings were placed in 0.1 per cent solutions of ammonium sulfate, sodium nitrate or urea for 16 hours before planting. While no rooting occurred, the best survival and callus formation was found in the cuttings supplied sodium nitrate. Ammonium sulfate was slightly injurious and retarded callus formation. In Doak's experiments with rhododendron cuttings, ammonium sulfate was superior to the nitrate salt. Recently, Thimann and Poutasse (24) found root formation in leaf cuttings of *Phaseolus vulgaris* promoted especially by adenine and potassium nitrate, while ammonium sulfate had an inhibitory effect.

From the numerous tests with cuttings of eastern white pine trees of intermediate and adult ages, a method or combination of methods was not found that would consistently promote the formation of roots. Unknown internal conditions governing root formation were but rarely favorably influenced by applications of auxins, sucrose or nitrogenous compounds.

#### TREATMENTS WITH FUNGICIDES

Decay of dormant pine cuttings in the propagating bench is a serious problem. The writer has found no reason to subscribe to the suggestion of Snow (18) that fungi in the propagating medium may be beneficial. Cuttings from some collections are more subject to decay than others and those from older trees are the most susceptible. The latter also require three to five months or more to form roots, thereby increasing the chances for infestation. With greenwood cuttings taken during the summer and propagated in outdoor benches, the time required for root formation is longer than with dormant cuttings. Previously, Deuber (3), the use of peat or peat and sand mixtures was found to be less desirable for propagating media than sand, chiefly because of a greater prevalence of decay with peat or a peat and sand mixture than with clean sand. While the use of fresh clean sand is helpful in preventing decay of the cuttings, rotting of stem bases usually appears within the second or third month. Grace (9) encountered difficulty with decay when using sucrose and reported that treatment of the sand with ethyl mercuric bromide eliminated fungus infestation from Norway spruce cuttings. In the early part of this investigation tests were made of the effectiveness of acidifying the sand, treating the sand with ethyl mercury iodide, and disinfecting the cuttings with mercuric chloride solution or an organic sulfur dust.

When the sand was acidified with acetic acid to give a reaction of pH 4.0, there was no appreciable difference between the number of cuttings that decayed as compared with the controls in sand at pH 6.9. A preparation of ethyl mercury iodide supplied by the Research Department of the Bayer-Semesan Co. was applied to the sand a week before planting pine cuttings. Considerable chemical injury was associated with this treatment. The bark and cambium of the lower portion of the stems became discolored and many of the cuttings died within two months.



One method of disinfecting the cuttings was to stand the bases of the cuttings or to immerse the entire cuttings for five minutes in an acidified solution of mercuric chloride according to the procedure recommended by Leach *et al.* (13) for potato seed pieces. These treatments gave a preliminary protection from fungi but were not entirely free of injurious action. The most successful method tried was one in which the cutting bases were dipped in an organic sulfur dust preparation supplied by the Research Department of the Bayer-Semesan Co. Applications of the sulfur dust preparation did not interfere with previous treatments with solution or dust applications of auxins. The sulfur fungicide gave considerable protection to the cuttings over periods of three to five months and was considered especially useful when new cuttings were planted in sand in which pine cuttings had been previously grown.

#### THE INFLUENCE OF DORMANCY-BREAKING CHEMICALS

Although the seasonal characteristics for the optimum time to collect eastern white pine cuttings for propagation has not been determined, the general trend in work with dormant cuttings in 1939-1940, Deuber (3), indicated that rooting was more likely to occur when the cuttings were taken in January through March in the vicinity of New Haven, Conn. Norway spruce shoots, on the other hand, reached an optimal state for collection in December. To see if activity of the buds of eastern white pine and Norway spruce shoots could be stimulated and root formation influenced, a few tests were conducted in November and December with the dormancy-breaking chemicals ethylene chlorhydrin and thiourea.

Vapor treatments with ethylene chlorhydrin consisted in placing the cuttings in sealed flasks containing one drop of the chemical per liter for 2, 4 and 25 hours. Norway spruce cuttings were severely injured in all three of the time periods. The pine cuttings did not show early visible signs of injury but within 38 days most of them died without bud development or rooting being influenced. Pine cuttings subjected to a similar concentration of the vapors of ethylene chlorhydrin for periods of 10, 20, 40 and 60 minutes survived for over two months, but neither bud opening nor rooting occurred. Standing the bases of pine and spruce cuttings or immersing the entire cuttings in 2 per cent solutions of thiourea for 1 to 3 hours reduced the survival of the cuttings of both species and did not positively influence bud development or root formation. The preliminary results with these treatments did not warrant additional tests.

#### THE ROOTING RESPONSES OF OTHER SPECIES OF FIVE-NEEDED PINES

The relative resistance of various species of five-needled pines to white pine blister rust caused by *Cronartium ribicola* has been under observation for many years. Among the American forest pathologists who have studied this problem are Spaulding (19, 20, 21), Lachmund and Hansbrough (12), and Hirt (10). Since the root regeneration characteristics of all but *Pinus Strobus* appear to be practically unknown, the writer took the opportunity

to test the rooting of the shoots of seven species of *Pinus* growing in the Arnold Arboretum. The species tested were: *Pinus monticola*, *P. parviflora*, *P. koraiensis*, *P. peuce*, *P. Cembra* and *P. Lambertiana*. In addition, a collection of branches from ten trees of *P. Lambertiana* was kindly supplied by Mr. James L. Mielke, U. S. Department of Agriculture, Division of Forest Pathology, from San Francisco, Calif.

Since the number of trees of a given species in the Arnold Arboretum was limited, cuttings were taken from individual trees, and in all but *P. Cembra* they were mature, ranging in age from 32 to 69 years old. Trees of *P. Cembra* 12 and 23 years old were available. The trees from which the California collection of *P. Lambertiana* were secured ranged between 12 and 25 years in age. The data of these tests are recorded in Table 4.

TABLE 4.

ROOTING RESPONSES OF THE CUTTINGS OF SEVEN SPECIES OF FIVE NEEDLED PINES.

Species	Age in years	Total No. cuttings	No. per group	Rooted
				%
<i>P. monticola</i> .....	56	196	18	5.5
<i>P. monticola</i> .....	45	120	20	0
<i>P. parviflora</i> .....	69	80	20	0
<i>P. flexilis</i> .....	56	80	20	0
<i>P. koraiensis</i> .....	36	60	15	0
<i>P. peuce</i> .....	32	220	20	0
<i>P. Cembra</i> .....	23	200	25	0
<i>P. Cembra</i> *.....	12	60	30	30.0
<i>P. Cembra</i> **.....	12	60	30	10.0
<i>P. Lambertiana</i> .....	57	40	20	0
<i>P. Lambertiana</i> .....	12 to 25	660	30	0

\*Cuttings made from shade shoots. \*\*Cuttings made from sun shoots.

Exceedingly limited rooting of the cuttings of these trees was found. This may be attributed to the age of the parent trees or to other unknown circumstances which may also apply to the difficulty in rooting found with the older age classes of eastern white pine. Some of the exotic pine trees were in a vigorous condition, while others were not. The *P. monticola* tree from which one cutting rooted was vigorous and its cuttings survived in large numbers during the first 90 days in the propagating bench. The cuttings from trees of *P. koraiensis*, *P. flexilis* and *P. parviflora* decayed and died in large numbers. The rooting responses of 30 per cent with shade shoots and 10 per cent with sun shoots of a 12-year old tree of *P. Cembra* is of interest because of the recognized resistance of this species to white pine blister rust, Spaulding (21) and Hirt (10).

The large collection of cuttings of *P. Lambertiana* trees from their

natural range in California survived very well for over six months. Callus development was stimulated by several treatments with auxins but no rooting occurred. After six months, chlorosis of the needles became general and many cuttings died. The cuttings of one collection of this species from a tree in the Arnold Arboretum behaved in a similar manner to those collected in California. This preliminary survey of the rooting characteristics of seven species of five-needled pines growing in the Arnold Arboretum and one from its native range indicates that similar problems in root regeneration apply to these species as found with those of eastern white pine trees. The cuttings root with great difficulty.

#### DISCUSSION

The general results of this investigation indicate that the vegetative propagation of five-needled pines has some very definite limitations. Somewhat over 10,000 dormant cuttings were placed under conditions favorable for root regeneration, but consistent rooting, with a few exceptions, occurred only with cuttings from young trees, 2 to 6 years old. Occasional rooting in relatively low percentages characterized the cuttings secured from trees 7 years old and older. Even cuttings from juvenile stock of these pines do not root as promptly nor as abundantly as cuttings from species that root easily. Unknown features of the shoots or parent trees from which they are obtained make the regeneration of roots an exceedingly uncertain process.

Considerable evidence indicates that standard methods of applying root-inducing chemicals in the form of dusts or solutions are especially effective with cuttings from young trees. These treatments were most effective when the control cuttings were able to root to some extent. The treatments hasten the formation of roots and increase the number of cuttings that root. Hastening root formation is highly significant, for the survival of unrooted cuttings is constantly threatened by drying out and by decay. Delisle (2) described some of the histological and anatomical changes induced by auxin treatment of eastern white pine cuttings but concluded that differences in rooting ability between cuttings of young and old trees appeared to be largely of a physiological nature.

Occasionally applications of auxins increased the rooting of cuttings from older trees, but the action was not consistent. The best responses were obtained when the control cuttings possessed some ability to root. A retreatment of cuttings with indolebutyric acid in talc after they had been in the bench two or three months was a favorable practice in several experiments. Supplying sucrose to the cuttings was favorable at times but not consistently so. Placing the cuttings in solutions of nitrogenous compounds did not increase the rooting.

There were some indications, but not conclusive ones, that moderately suppressed trees yield cuttings that root more readily than those from highly vigorous trees. Shade shoots of one *Pinus Cembra* tree rooted much better than sun shoots. These observations appear to be in order with the



well established facts that lateral shoots root more readily than terminal and that shoots from lower branches root better than those from near the top of the crown.

Some evidence supports the view that ability to root varies markedly from tree to tree. But the data are not so conclusive as those obtained by Snow (16) with red maple cuttings or for Norway spruce by Deuber (3). In the few instances in which collections of cuttings were made from the same pine trees for two seasons, the rooting responses of the second year's collections were much less than the first. It is therefore not possible to state that adult eastern white pine trees which yield cuttings that root one season will continue to yield cuttings that will root in succeeding years.

From studies of the rooting characteristics of many five-needled pine cuttings over a period of three years, the suggestion is put forth that some factor in the nature of an inhibitor will be found to account for the difficulties experienced in root regeneration. It was found by Jacobs (11) that cuttings from trees of *Pinus radiata* up to 6 years old were the most dependable for propagation purposes. Cuttings with terminal buds containing male cone primordia always failed to root and most of the vigorous shoots of trees 7 to 8 years of age possessed male cones. It was reported by Deuber (3) that shoots of *P. densiflora* from branches bearing young ovulate cones rooted much more abundantly than those from branches without ovulate cones. In the present study, a marked transition appeared to occur in ability to root between eastern white pine cuttings from trees up to 6 years old and those 7 years old or older. The cuttings from 7-year old trees responded to auxin treatment much like cuttings from younger trees. With the exception of a few trees 15 years old, the cuttings from older trees did not respond to any appreciable extent to auxin applications. It is quite possible that such facts as the greater ability of lateral shoots to root than terminal or branch terminals, those from the basal branches of the crown than those from the apical branches, and the more frequent rooting of cuttings from somewhat suppressed trees than very vigorous trees will be explained on the basis of a physiological inhibitor.

In view of the uncertainties with root regeneration with cuttings of older five-needled pine trees, vegetative propagation may for the time be confined to young stock. Nursery or field stock 4 to 6 years old yields sufficient numbers of cuttings to multiply superior types of trees. Stock in these age classes can be tested for resistance to diseases common to juvenile and adult trees as is being done by Hirt (10). Valuable progeny of tree breeding experiments may be increased by vegetative propagation of young stock.

## SUMMARY

The rooting of numerous collections of dormant stem cuttings of *Pinus Strobus* were tested as well as those of lesser numbers of cuttings of *P. monticola*, *P. parviflora*, *P. flexilis*, *P. koraiensis*, *P. peuce*, *P. Cembra* and *P. Lambertiana*.

Cuttings from eastern white pine trees 2 to 6 years old possessed considerable natural ability to root.

With the exception of a few trees 15 years old, cuttings from trees 8 to 90 years old rooted only occasionally and in relatively low percentages or not at all.

Treatment of the cuttings of young stock with indolebutyric acid or  $\alpha$ -naphthaleneacetic acid in talc dusts or in aqueous solutions was effective in hastening and increasing the rooting responses.

Similar treatments with cuttings from older trees were somewhat effective in a few collections but not consistently so.

Indolebutyric acid supplied in lanolin paste or in lanolin emulsion was generally unsatisfactory. In many cases injury to the stem bases occurred with the paste applications.

Ends of toothpicks saturated with alcoholic solutions of indolebutyric acid or  $\alpha$ -naphthaleneacetic acid inserted in the bases of cuttings made from branch terminal shoots of 6-year old trees were effective in inducing root formation. Similar treatment of cuttings from lateral shoots of older trees generally produced chemical injury.

Supplying sucrose to the cuttings with or without auxin did not appreciably influence root formation.

Placing the cuttings in solutions of ammonium sulfate, sodium nitrate or urea, preliminary to planting, did not increase the formation of roots. Sodium nitrate was favorable to callus development while ammonium sulfate was slightly injurious.

Cuttings secured from eastern white pine hedges pruned annually did not root as satisfactorily as those from normal trees of the same age.

Some evidence of clonal variation in rooting ability was found among various collections of cuttings from individual trees.

Dipping the bases of cuttings in an organic sulfur fungicide gave the most satisfactory protection against decay.

The dormancy-breaking chemicals ethylene chlorhydrin and thiourea were not effective in forcing the development of buds or roots.

Cuttings from adult trees of *Pinus parviflora*, *P. flexilis*, *P. koraiensis*, *P. peuce*, *P. Cembra* and *P. Lambertiana* did not root.

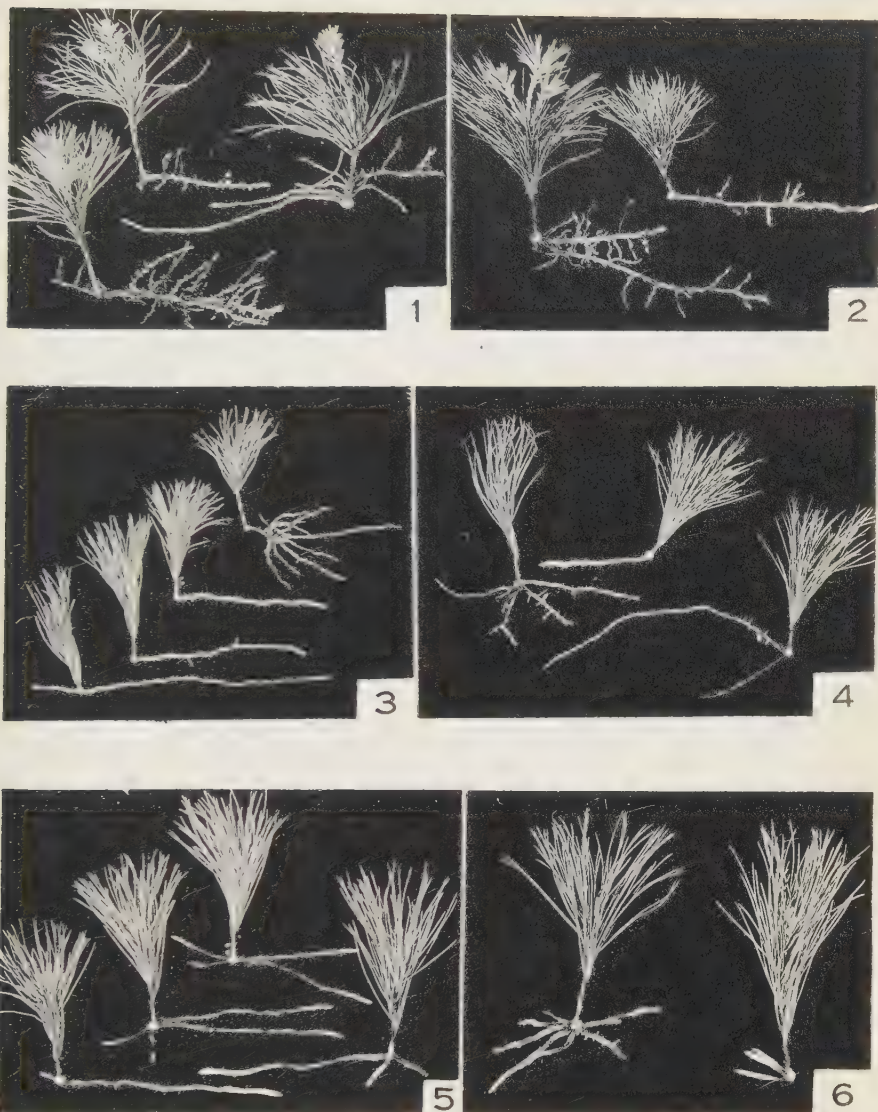
Low rooting occurred in one collection of cuttings from one tree of *P. monticola*.

The shade shoots of a *P. Cembra* tree 12 years old rooted considerably better than sun shoots.

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DEUBER, VEGETATIVE PROPAGATION OF EASTERN WHITE PINE



## EXPLANATION OF PLATE

*Pinus Strobus* cuttings from trees 2 to 7 years old. Planted in January and photographed after 134 days in the propagation bench.

- Fig. 1. Cuttings made from terminal shoots of trees 2 years old. No chemical treatment.
- Fig. 2. Cuttings from trees 3 years old, the one on the left from a terminal shoot, the one on the right from a lateral shoot. No chemical treatment. In these and the cuttings in Fig. 1 lateral root development was much more advanced than in cuttings from older trees.
- Fig. 3. Cuttings from trees 4 years old made from lateral shoots. No chemical treatment.
- Fig. 4. Cuttings from trees 5 years old made from lateral shoots. Treated with indolebutyric acid in talc.
- Fig. 5. Cuttings from trees 6 years old made from lateral shoots. Treated with indolebutyric acid in talc.
- Fig. 6. Cuttings from trees 7 years old made from lateral shoots. Treated with indolebutyric acid in talc.

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## A STUDY OF MANIHOT IN NORTH AMERICA

LEON CROIZAT

*With one text-figure*

THIS paper aims at presenting a preliminary account of the North American species of *Manihot* Mill. which have been confused in herbarium and in the literature as *M. carthagenensis* Jacq. The species so confused exceed ten in number, and the uncertainty as to their limits and distribution is now so great that all classification outside of the limits of a critical work has become impossible.

The difficulties in the path of a taxonomic treatment of *Manihot* are notorious. The foliage of the genus is polymorphous, the flower seldom very revealing, and the material available even in the best herbaria often incomplete or misleading, because seeds of different species often become mixed at mounting. In addition, the progress of speciation among forms of the same group is comparatively weak, so that related species are connected by intergrades which can be placed with much difficulty or not at all when field-notes are lacking. I have been fortunate in having loans of much needed specimens from the Curators of the U. S. National Herbarium, the University of California, the New York Botanical Garden, the University of Arizona, and the Gray Herbarium of Harvard University. These specimens are cited, respectively, under the abbreviations US, UC, NY, UA, and GH, the additional reference AA connotating specimens in the herbarium of the Arnold Arboretum of Harvard University.

Several of the specimens loaned from the U. S. National Herbarium bears manuscript names which have been neglected by their own and all subsequent authors. These names are of indifferent value, some having been superseded, others being doubtfully good. To simplify the citations, which in a work of this nature should be reduced as far as possible, I have consistently disregarded these *nomina nuda*.

In view of the generally accepted belief that *Manihot* as well as *Jatropha*, including *Cnidoscolus*, have flowers with a calyx but no corolla, it seems pertinent to emphasize the fact that so early an author as Pohl (Pl. Bras. Ic. Descr. 1: 17, 56. 1827) correctly interpreted the perianth of these genera, stating that these structures have a *corolla but no calyx*. Authors like Pax & Hoffmann (Pflanzenr. 44 (iv. 147. ii): 22. 1910; Engl. & Prantl, Nat. Pflanzenf. ed. 2. 19(c): 164, 174. 1931), who hold to the opinion that *Manihot* and *Jatropha* (with *Cnidoscolus*) have a calyx but no corolla, cannot appraise the significance of the relics of the calyx which appear in certain species of this alliance, and are thus liable to misunderstand the morphology and phylogeny of the Euphorbiaceae Jatrophaeae and Manihoteae.

The very nature of the plants under study and the difficulty of securing fully comparable specimens, even from large collections, make it impossible to prepare a truly workable key. The reader is referred to Fig. 1, in which typical outlines of leaf-lobes are illustrated and the species are grouped according to their foliar habit.

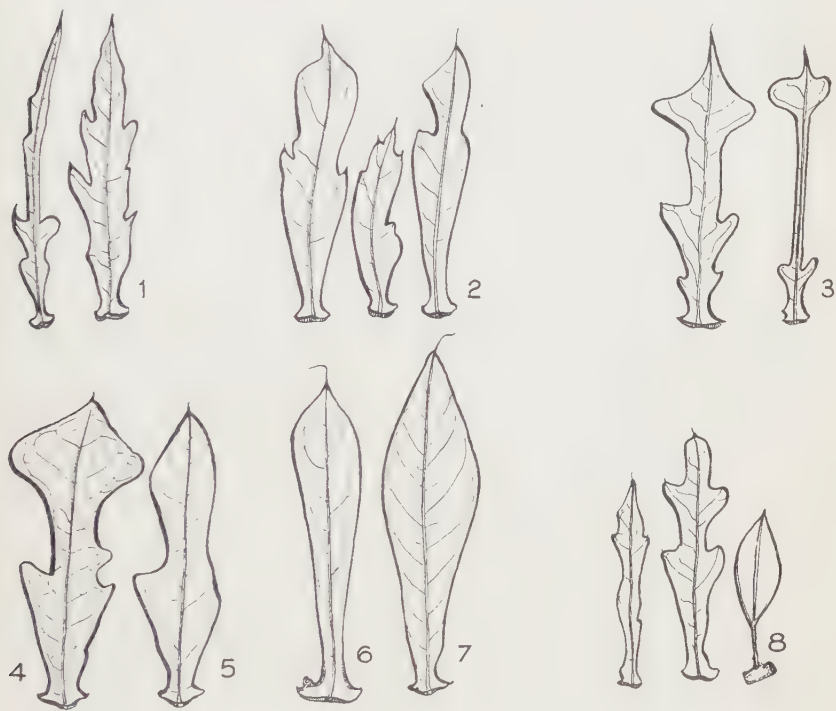


Figure 1

Typical leaf-lobes of *Manihot* spp.; 1. as occurring in *M. angustiloba* Muell.-Arg. (Arizona, Sonora, Chihuahua), *M. mexicana* Johnst. (Sinaloa, Jalisco, Aguascalientes, Guanajuato, Queretaro, Mexico, Morelos), and *M. parvicocca* Croiz. (Chiapas, Nicaragua, San Salvador); 2. of *M. chlorosticta* Standley & Goldm. (Baja California, Sinaloa); 3. of *M. Davisiae* Croiz. (Arizona); 4. of *M. intermedia* Weath. (Guerrero); 5. of *M. colimensis* Croiz. (Colima); 6. of *M. rubricaulis* Johnst. (Durango, Sinaloa) and *M. isoloba* Standley (Sonora, Chihuahua); 7. of *M. aesculifolia* Pohl (Honduras, Vera Cruz, Guerrero); 8. of *M. ludibundus* Croiz. (Nicaragua).

***Manihot carthagenensis*** (Jacq.) Muell.-Arg. in DC. Prodr. **15**(2): 1073. 1866; Pax & Hoffmann, Pflanzenr. 44 (iv. **147**. ii): 81. 1910.

*Janipha carthagenensis* Jacq. Select. Stirp. Amer. Hist. 256, Pl. 162, Fig. 1. 1763.

Pax & Hoffmann have little understanding of the distribution of this species, and *Palmer 1027a*, which they cite under it, is *M. colimensis* Croiz., a species that bears to *M. carthagenensis* but superficial resemblance. It is altogether probable that authors who report *M. carthagenensis* north of

Costa Rica are in error, and this species is *certainly* to be excluded from the flora of the United States.

The classic locality is "Passim Carthagenae," and I have so far seen but one specimen which I can safely bring under Jacquin's binomial, *Elias* 1546: Colombia, El Palmar, region of Barranquilla, 1937 (AA), distributed as *M. dulcis* var. *diffusa*. In this specimen are found the costulate lobes and perianth of the ♂ flower illustrated by Jacquin and the disc with a deep lobulation (the sinuses being fully to 2 mm. deep) which prompted Jacquin to describe a disc with stamens "E receptaculo inter nectararii radios adscedentia." The range of *M. carthagenensis* remains to be defined, as the plant of eastern Venezuela may not be this species.

**Manihot gualanensis** Blake, Contr. U. S. Nat. Herb. **24**: 13. 1922.

A photograph of the holotype (*Blake* 7688, US) is available here. It is unfortunate that all the available material lacks fruits, and that it proves impossible to decide whether Blake's species is in some measure conspecific with *M. aesculifolia* H.B.K. For the present, I identify as *M. gualanensis* the following two collections: *Maxon, Harvey & Valentine* 7192: Nicaragua, Ameya, Dept. Chinandega, 1923 (NY), originally distributed as *M. aesculifolia*, and *Gentle* 2539: British Honduras, Cayo District, Vaca, 1938 (AA), identified in herbaria as *M. carthagenensis*. The leaves are comparatively large and full for a species of this group.

**Manihot aesculifolia** (H. B. K.) Pohl, Pl. Bras. Ic. Descr. **1**: 55. 1827; Muell.-Arg. in DC. Prodr. **15**(2): 1065. 1866; Pax & Hoffmann, Pflanzenr. 44 (iv. **147**. ii): 58. 1910; Standley, Contr. U. S. Nat. Herb. **23**: 645. 1923.

*Janipha aesculifolia* H. B. K. Nov. Gen. & Sp. **2**: 107. Pl. 109. 1817.

The classic locality is "In litore sinus Champecensis." *Bangham* 300: Honduras, San Pedro Sula, 1939 (AA) is a perfect match of Kunth's plate. The leaf with 7 lobes and with the outer 2 lobes definitely reflexed, illustrated in the Nova Genera and exhibited by the *Bangham* collection, is not common in this species. In most cases the outline of the leaf is rounded toward the base on account of the failure of the two lowest lobes to develop. The median lobes are seldom pandurate, and if so, not deeply. In addition to the *Bangham* sheet already cited, I identify under this species: *Purpus* 8448, Vera Cruz, Barranca de Panoya, 1919 (UC, NY); *Hinton* 6486, Guerrero, Coyuca, "on cliffs, 1.5 m. high," 1934 (NY). The inflorescence is borne apically, and is subspicate to racemose, up to about 20 cm. long, the capsule when nearly ripe is globose, the columella about 8 mm. long, and the seed, not quite ripe, about 9 mm. long and 7 mm. broad.

The range of Honduras, Vera Cruz, and Guerrero is peculiar. Usually, the Euphorbiaceae of the east coast of Mexico are much more widely distributed than those of the west coast, and are seldom found to cross over from the coast of the Atlantic to that of the Pacific. *Hinton* 6486 cannot at present be classified otherwise than as *M. aesculifolia*, but a critical study of the distribution of this species should be undertaken as soon as possible.



**Manihot rhomboidea** Muell.-Arg. *Linnaea* **24**: 205. 1865; in DC. *Prodr.* **15**(2): 1064. 1866; Pax & Hoffmann, *Pflanzenr.* 44 (iv. **147**. ii): 55. 1910; Millspaugh, *Field Mus. Publ. Bot.* **1**: 375. 1898; Standley, *Contr. U. S. Nat. Herb.* **23**: 645. 1923.

Millspaugh cites *Schott 518* twice, under both *M. carthagenensis* and *M. rhomboidea*, noticing under the last that Schott spells the local name *Xcaxe*. *Schott 518* (US) is certainly conspecific with *Gaumer 1142* (AA. NY), and very likely the same as *Purpus 6112*: Baños del Carrizal, Vera Cruz, 1912 (UC). That one species is involved here seems well established, and Millspaugh errs in identifying it as *M. carthagenensis*, for the *Schott* material has in the ♂ flower a somewhat inflated and subentire disc, which does not agree in the slightest with the peculiarly lobate disc of Jacquin's Colombian plant. The type of *M. rhomboidea* cannot be seen, and I accept the collections cited under this binomial from description, finding in the material at hand characteristically minute basal lobes, which agree with Mueller's note: "Lobi infimi foliorum reliquis multo breviores."

**Manihot ludibunda** sp. nov.

Fruticulus videtur totus glaberrimus, caulibus novellis herbaceis gracilibus, vetustioribus ligneis crassitie pennae anserinae. Foliis ludentibus, ambitu totis nec ultra 5–6 cm. magnis, raro 1–3-lobatis, plerumque 5-lobatis; lobis 2–4 cm. longis, spatulato-oblongis vel (basalibus) oblanceolatis, mediis saepissime constricto-panduratis, apice dilatato-quadrangulatis, breviter acuminatis subsetulosis, laminae parte integra vix 2–3 mm. magna, inde lobis fere ad petioli radicem liberis; petiolo gracili, 1.5–5 cm. longo, stipulis minimis vel nullis. Inflorescentia gracili, apicali vel laterali, 3–5 cm. longa. Flore ♂: pedicello gracillimo 7–10 mm. longo, stipulis persistentibus nullis; perianthio ca. 10 mm. longo, lobis ovato-acuminatis vix 3–3.5 mm. longis, totidem latis, disco cum pistillodio, margine (videtur) profundius 2-lobulato ca. 2 mm. magno, staminibus (videtur) 10 in serie duplici, longioribus ad 8, brevioribus ad 5–6 mm. longis, filamentis gracillimis. Flore ♀: (vix maturo) lobis 5, liberis, lanceolato-ellipticis, ca. 4 mm. longis, 1.5 mm. latis, ovario costulato 2 mm. longo, 1.75 mm. lato, disco carnoso 2 mm. lato, 1 mm. longo, stylis carnosis more generis ramosis.

GUATEMALA, Dept. Huehuetenango, Uaxackanal, 1300–1400 m., C. & E. Seler 2814, July 1896 (NY, TYPE).

I know of no other species to which this plant can be assimilated. The lone simple leaf that appears on the type-specimen may be occasional, but it is worthy of notice as an indication of the tendency of *M. ludibunda* to have less than 5 lobes in each leaf. The ♂ perianth and the foliage agree neither with *M. parvicocca* nor with *M. rhomboidea*. The type was originally distributed as *M. carthagenensis*.

I treat *Manihot* as a name of the feminine gender to conform with Crantz's early usage of the genus (*Inst.* **1**: 167. 1766). Neither Miller (*Gard. Dict.*, Abridg. edit., 1754) nor Adanson (*Fam. Pl.* **2**: 356. 1763) lists binomials.

**Manihot parvicocca** sp. nov.

Fruticulus videtur, totus glaberrimus. Foliis profundissime lobatis, habitu primo intuitu dissectis, illis *M. angustilobae* simillimis; limbo

toto ad 16 cm. transverse magno, lobis 5-7, infimis 2 interdum minimis, quove sublineari longissime acutato, 10-20 vices longiore quam lato, majoribus ca. 10 cm. longis, 4-5 mm. latis, lobulis 1-2 saepissime incurvis auctis, minoribus linearibus vix ultra 2-3 cm. longis, elobulatis vel tantum leviter repandulis, petiolo ad 5-6 cm. longo. Inflorescentia terminali gracili ad 10 cm. longa. Perianthio ♂ campanulato ca. 10 mm. longo, 5-6 mm. lato, lobis ovato-triangularibus ca. 3 mm. longis totidemque latis, disco plus minusve lobulato (videtur) ad 3 mm. magno, staminibus in serie (videtur) duplici 7-9, 5-6 mm. longis. Perianthio ♀ ignoto; fructu capsulari globoso vix 8-10 mm. magno, epicarpio fungoso more generis secedibili, coccis delapsis 8-9 mm. longis, columella 3-4 mm. longa, semine scaraboeo appanato, 5-6 mm. longo, 4.5 mm. lato, caruncula valida flabellata, erecta, 3 mm. lata, 1.5 mm. longa, arillo in semine maturo ochraceo vel cinereo, maculis longitudinalibus olivaceis paucioribus insignito.

MEXICO, Chiapas, Siltepec (south of the town of Chicomuselo, near the Guatemalan boundary), *Matuda* 1665, Aug. 1937 (TYPE, AA); Chiapas, near Montserrat, "on rocky mountains," *Purpus* 10213 (NY, UC); Chiapas, Hacienda Montserrate, *Purpus* 9233 (UC); Chiapas, top of ridge back of Tonalá, alt. 1200-2500 ft., *Nelson* 2899 (GH).

Probably here belong two other specimens from Central America, *Pittier* 132, Guatemala, Baja Verapaz, Cuesta de Cachil, alt. 1200-1600 m., 1905 (NY); *Calderón* 1023, San Salvador, Cerro de la Olla, 1922 (NY). The extension of the range of a Chiapas species to Guatemala, Dept. Baja Verapaz, is to be expected and I find nothing in the poor *Calderón* collection at hand which is incompatible with the characters of typical Chiapas material. *Manihot parvicocca* would seem to be the southern counterpart of *M. mexicana* Johnst., of which it has the small capsule. *Manihot mexicana*, however, has a much larger ♂ flower and leaves that are on the whole more lobulate-repand. The columella of *M. parvicocca* is remarkable for its shortness and bluntness, that of *M. mexicana* being about twice as long (up to 7 mm.) and not very blunt. The *Nelson* collection is cited with doubt by Johnston in the publication of *M. mexicana*.

***Manihot mexicana*** Johnst. Contr. Gray Herb. 68: 90. 1923.

This proves to be a very important species, with affinities that are certainly not in the direction of *M. rubricaulis* Johnst. By its range and characters, *M. mexicana* connects *M. angustiloba* Muell.-Arg. (Arizona, Sonora, Chihuahua) with *M. parvicocca* Croiz. (Chiapas, Guatemala, San Salvador), the distribution of the complex thus involved being one of the largest.

To the numerous specimens cited by Johnston in the original publication the following may be added: *Palmer* 222, Sinaloa, Topolobampo, 1897 (US); *Rose* 1608, Sinaloa, between Rosario and Colomas, 1897 (US); *Rose & Rose* 11190, Queretaro, near Queretaro, 1906 (NY); *Rose & Hay* 6201, Aguascalientes, near Aguascalientes, 1901 (US); *Lyonnet* 301, Morelos, Cuernavaca, 1929 (NY); *Hinton* 6188, Mexico, Temascaltepec, 1934 (NY). None of these specimens is in fruit, so that the determinations are tentative. The extension of the range of *M. mexicana* to Sinaloa seems to be authenticated by *Rose* 1608, which quite agrees with typical material of the species. *Palmer* 222, on the contrary, is very close to the Guaymas

plant (*Palmer 233*), which the seed shows to belong to *M. angustiloba*. The plants from Aguascalientes and Queretaro may actually represent a strong variety. On the basis of the available material, *M. mexicana* would seem to occur in Jalisco (loc. class.: hillsides of Zapotlan), Sinaloa, Aguascalientes, Guanajuato, Queretaro, Morelos, Mexico. It is not impossible that the holotype of *M. mexicana* will prove to be a form on the outskirts of the biological limits of the species.

*Gregg 198*, from an unknown locality but collected in 1848 or 1849, cited by Johnston in the publication of *M. mexicana*, is probably the same as the plant of Queretaro, Aguascalientes and Morelos, and there are good historical and botanical reasons to believe that it was also collected in this general region. Its flowers are small, apparently not as large as those of the plant of Jalisco.

***Manihot intermedia*** Weatherby, Proc. Am. Acad. **45**: 427. 1910, (Contr. Gray Herb. **2**: 427. 1910); Pax & Hoffmann, Pflanzenr. 44 (iv. **147**. ii): 101. 1910; Standley, Contr. U. S. Nat. Herb. **23**: 643. 1923.

A very distinct species, so far as known localized in Guerrero, Mexico. The larger lobes of the leaf are usually deeply pandurated, very glaucous, and pale green. The flowers in the holotype, *Pringle 13938* (loc. class., cañon near Iguala) are subtended by bristly persistent bracteoles and the perianth is deeply colored. The seed is scaraboid, that is, depressed in back and front, with sharp lateral keels, 10 mm. long, 8 mm. broad; the caruncle is very large, about 6 mm. broad and 2 mm. long, fan-shaped. Here belong: *Rusby 2*, Limon Mt. alt. 4000 ft., 1910 (NY); *Mexia 8778*, Sierra Madre del Sur, north of Río Balsas, Distrito Adama, "streamside, suffrutescent, 3.5 m. high, many stemmed," 1937 (NY). The seed on this specimen is brightly colored, shiny, with many fine dorsal mottlings from side to side.

***Manihot colimensis*** sp. nov.

Frutex videtur glaberrimus. Foliis pro more 5-lobatis, totis ad 11 cm. longis, 12–15 cm. latis, lobis fere ad petioli radicem partitis, saepissime oblongo-panduratis apice abrupte dilatatis, ad 11 cm. longis, 1–2.5 cm. latis, subtus plus minusve glaucis in sicco membranaceis fragillimis; petiolo gracili 4.5–7 cm. longo, stipulis nullis. Inflorescentiis apicalibus ad 10 cm. longis, bracteolis deciduis. Floribus ♂: perianthio 9–11 mm. longo, ca. 7 mm. lato, in lobis 5 ad 9 mm. longis partito, lobis ovato-triangularibus margine carnosis, disco in lobis 5, quove ad apicem retuso (inde disco duplicatolobato) partito, ca. 4–5 mm. lato, staminibus 10 in serie duplici, 7–8, 10–11 mm. longis. Floribus ♀: perianthio ad basim partito, lobis 5 lanceolatis, ad 10 mm. longis, 2.5–3 mm. latis, ovario glabro ca. 2.5 mm. longo, 2 mm. lato, in sicco costulato, stylis multipartitis, disco in ovarii epicarpium more generis confluyente ad 3 mm. lato, 1 mm. longo. Capsula matura pedicello ultra 3 cm. longo fulta, coccis delapsis ad 15 mm. longis, semine ellipsoideo, facie ventrali praesertim depresso, brunneo, in dorso longitudinaliter striato, 14 mm. longo, 9 mm. lato, caruncula minima, vix 1.5 mm. lata, 1 mm. longa.

MEXICO: Colima, Manzanillo Bay, "on rocky points," *Ferris 6140*, 1925 (TYPE, AA); Manzanillo, *Palmer 1027, 1027a*, 1890 (US, NY).

*Palmer 1027a* is cited by Pax & Hoffmann, as already noticed, under *M. carthagensis*, which *M. colimensis* but superficially resembles. The



affinities of this new species are definitely toward *M. chlorosticta* Standl. & Gold., from which it is separated by the ellipsoid longer seed, a character which seems to hold good throughout, and by the range. *Manihot chlorosticta* bears to *M. colimensis* probably the same distributional and morphological relationship which *M. mexicana* bears to *M. parvicocca*. Critical forms between *M. chlorosticta* and *M. colimensis* may be looked for in Jalisco and Tepic.

***Manihot chlorosticta*** Standley & Goldm. Contr. U. S. Nat. Herb. **13**: 375. 1911.

*Manihot carthaginensis* Standley, Contr. U. S. Nat. Herb. **23**: 643, *p. p.* 1923; non Jacq.

I cannot follow Standley in merging *M. chlorosticta* and *M. carthaginensis* as one species, believing that the entities involved under these binomials are obviously different geographically as well as morphologically. A photograph of the type (*Nelson & Goldman* 7401, US) is available here and this collection perfectly matches two topotypes, *Brandeggee* 550, Lower California, San José del Cabo, Sept. 1890 (UC); *Brandeggee s.n.*, San José del Cabo, Lower California, Nov. 1902 (UC). I cannot separate the plant from Lower California from the plant of Sinaloa, as the seed of *Ferris & Mexia* 5218, Sinaloa, vicinity of Labradas, "woody vine near the railroad tracks," 1925 (AA) is absolutely the same as the seed of *Brandeggee* 550, the agreement among the other characters being otherwise of the closest. Likewise, the robust and long peduncle of the capsule of *Ferris & Mexia* 5218 and *Brandeggee* 550 is fully matched by that of *Rose* 3266, Sinaloa, between Rosario and Concepción. 1897 (US). I believe that *M. chlorosticta* is further represented by the following six collections, all from Sinaloa: *Rose* 3204, foothills of the Sierra Madre near Colomas, 1897 (US); *Rose s.n.*, road between Acajoneta and Rosario, 1897 (US); *Brandeggee s.n.*, Culiacan, Aug. 1904 (UC); *Ortega* 5586, El Pozole, 1925 (US); *Ortega* 6345, Escamillas, Aug. 1926 (UC, US); *Gentry* 5026, Cerro east of Culiacan, basaltic hill-slope in Short-tree Forest, "long smooth-stemmed succulent vine on trees and shrubs," Nov. 1939 (NY). The *Brandeggee* collection from Culiacan is somewhat doubtful under this binomial and may yet represent a new species. Its seeds are smaller than those of the plant of Lower California, and the infructescence (unfortunately too young to allow a full comparison) is slightly different, manifestly racemose. It is possible, however, that the long and robust "peduncle" of the capsule of *M. chlorosticta* is in reality a persistent and accrescent section of the axis of the inflorescence which supports the lone fruit that ripens. The limits of *M. chlorosticta* in the direction of *M. intermedia* will bear close study.

***Manihot rubricaulis*** Johnst. Contr. Gray Herb. **68**: 90. 1923.

According to Palmer's field-notes transcribed by Johnston on the type (GH), the type number, *Palmer* 224 (also US, UC) was collected near Durango City, "on the east slope of Iron Mt.," and taken from a many-stemmed shrub 4-5 ft. high, with leaves borne at the tip of the reddish-barked twigs. A collection from Sinaloa, *Brandeggee s.n.*, Cerro Colorado, Culiacan (UC) probably belongs here, despite its having dehiscent cocci somewhat longer (15 mm.) than those of typical material of Johnston's

species (12–13 mm.). The material is too poor even to attempt a varietal disposition of Brandegee's plant.

*Manihot isoloba* Standley, discussed next, is quite near *M. rubricaulis* Johnst., although the two binomials are not manifestly synonymous. Both these species have a foliage with characteristically linear lobes, acute at the tip and here capped with a long bristle, the native name of *M. isoloba*, "pata de Gallo" (Rooster's foot), being very appropriate. The sinuses between the lobes are calloused and bear in many of the leaves of *M. rubricaulis* an abortive hydátode or gland.

Mueller Argoviensis gives of *M. microcarpa*, based upon a specimen of Karwinsky collected in Mexico without further indication of locality, a description (Flora 55: 42. 1872) which strongly suggests the characters of *M. rubricaulis*. In addition, Mueller compares the Karwinsky plant to *M. digitiformis* Pohl (Pl. Bras. Ic. Descr. 1: 36. Pl. 27. 1827), which is significant because Pohl's species has the foliage and the habit of *M. rubricaulis* and *M. isoloba*. It is probable that a study of the holotype of *M. microcarpa*, not now available, will prove that this species is synonymous with *M. rubricaulis*.

**Manihot isoloba** Standley, Field Mus. Publ. Bot. 17: 197. 1937.

The two collections cited by Standley in the original publication, *Gentry* 2372, Chihuahua, Guasaremos, Rio Mayo, 1936 (AA), and *Gentry* 1468, Sonora, Bakachaka, Rio Mayo (AA, UC, distributed as *M. angustiloba*), are available here. The foliage is almost identical to that of *M. rubricaulis*, differing from it, apparently, in the somewhat broader leaf-lobes, these being 5–8 in each leaf rather than 4–7, as in Johnston's species. The seed in *M. isoloba* is definitely less ellipsoid (10 mm. long, 8 mm. broad) than it is in *M. rubricaulis* (10 mm. long, 6.5 mm. broad), but the value of this character, given other close similarity between the two species, remains to be studied.

A collection represented by two sheets (US, NY) is *Townsend & Barber* 404, Chihuahua, Sierra Madre near Seven Mines, Sept. 1899. The material consists of detached leaves and seeds. The seed is a trifle bigger than that of *M. isoloba* (about 11 mm. long, 8 mm. broad, the difference being fairly noticeable at sight) and the lobes are up to 14 cm. long and 2 cm. broad, occasionally very shallowly repand. I find no reason at present to grant separate recognition to this plant, which may prove ultimately to be a variety of *M. isoloba* or of *M. rubricaulis* (= ? *M. microcarpa*). The ranges are: *M. rubricaulis* in Durango and Sinaloa; *M. isoloba* in Chihuahua and Sonora.

**Manihot angustiloba** (Torrey) Muell.-Arg. in DC. Prodr. 15(2): 1073. 1866; Pax & Hoffmann, Pflanzenr. 44 (iv. 147. ii): 83. 1910.

*Janipha Manihot* H. B. K. var. *angustiloba* Torrey in Emory's Rept., U. S. Mex. Bound. Surv. 2: 199. 1859.

Several species are manifestly included by Pax & Hoffmann in the range they give of this species, Oaxaca, Cuantla, Jalisco, New Mexico and, with doubt, "Acapulco in Peru." I have seen *M. angustiloba* only from Sonora, Chihuahua and Arizona, and suspect that the record from New Mexico is wholly based upon the erroneous label of *Wright* 1811. Wootton & Standley

exclude *Manihot* from their flora of this State (Contr. U. S. Nat. Herb. 19. 1915), which I take to be correct. Tidestrom & Kittel overlook *M. angustiloba* in their recent flora of Arizona (Fl. Ariz. & New Mex. 718. 1941), listing only *M. carthagenensis* from the canyons of the Santa Catalina Mountains. This record applies in all probability to *M. Davisiae* Croiz., although it might include *M. angustiloba* to a very small extent. *Manihot acutiloba* Weatherby, cited by Pax & Hoffmann in the synonymy of *M. angustiloba*, has no status in nomenclature. In writing this binomial Weatherby intended to refer to *M. angustiloba*, the synonym taken up by Pax & Hoffmann thus proving to be a mere slip of the pen which is to be corrected as "a clearly unintentional orthographic error" (Art. 70, Intern. Rules Bot. Nomencl.) and otherwise disregarded. *Pringle 11318*, identified by the same authors as *M. angustiloba*, is *M. mexicana* Johnst., and is cited in the publication of this species.

Excluding the doubtful collection from "New Mexico" represented by *Wright 1811* (US, NY), which was probably taken on the Mexican side of the border in Sonora, I have seen the following material: (1) From Mexico — *Schott iii 8*, Sonora, Sierras oeste de Sta. Cruz y Tubac, 1855 (holotype, NY); *Schott s.n.*, Sonora, Potrero on the upper Sta. Cruz River (NY); *Palmer 233*, Sonora, Guaymas, 1887 (US, NY); *Gentry 2371*, Chihuahua, Guasaremas, Rio Mayo, "One or two feet high, cespitose perennial with white flowers. On open knoll of thin gravel soil. Infrequent," 1936 (US, UC); *Wiggins 7155*, Sonora, 20 m. S.E. of Magdalena, 1934 (AA) — (2) From Arizona — *Lemmon s.n.*, Santa Catalina Mts. 1883 (US, UC); *R. E. Kunze s.n.*, Nogales, 1911 (US); *Thackery 487*, Baboquivari Flats, Pima Co., 1928 (AA, NY); *Peebles, Harrison & Kearney 4584*, Nogales, 1927 (US); *Harrison & Kearney 6031*, Nogales, 1929 (US); *Kearney & Peebles 8742*, Rincon Mts., 1932 (US, UC); *Harrison & Kearney 8904*, Santa Rita Mts., 1932 (US); *Kearney & Peebles 14928*, below Baboquivari Canyon, Pima Co., alt. 3100 ft., 1940 (NY).

All the Arizona and the majority of the Sonora and Chihuahua specimens are correctly determined. *Manihot angustiloba* reaches its northernmost distributional limits in southern Arizona, only one collection being reported from the Sta. Catalina Mountains; it is frequent in Sonora and rare in Chihuahua. Its affinities are with *M. mexicana*, but its seed is much larger.

The Guaymas plant has leaves and seeds that are a trifle larger than those of the form commonly found elsewhere. It remains to be seen whether these differences are important. A clue to the conditions of the specimens from Guaymas is given in a manuscript note on the sheet of the U. S. National Herbarium, reading: "Growing 2 or 3 ft. high, in the shade of high mountains above Guaymas." Under these conditions a large leaf is to be expected, and it is further probable that the plant from which the material was taken had grown in a habitat more favorable than the usual xerophytic or subxerophytic environment of the Arizona specimens.

***Manihot Davisiae* sp. nov.**

Frutex glaber, innovationibus herbaceis viridibus vel interdum levissime



pruinoso-glaucescentibus. Foliis pro more 5-lobatis, majoribus ambitu toto ad 13-16 cm. magnis; lobis 2 infimis lanceolato-acutatis vel subabortivis quapropter magnitudine valde ludentibus, reliquis 4-9 cm. longis, 0.5-4 cm. latis, optime repandis, saepissime in lobis 2 dilatatis, quorum infero obtriangulari, 5 cm. lato vel minore, supero quadrangulato in apicem acutum vel subcaudatum brevissime aristulatum desinente ad 4 cm. lato, limbi parte communi integra 1 cm. tantum lata vel minore, inde lobis fere ad petioli radicem liberis; petiolo herbaceo 3-6 cm. longo, stipulis subsetaceis minimis. Inflorescentiis terminalibus herbaceis, gracilibus, ad 12-15 cm. longis, bracteolis linearibus sat persistentibus. Flore ♂: perianthio ca. 12 mm. longo, 6 mm. lato, lobis triangularibus sat acuminatis ca. 7 mm. longis, disco pistillodium minutum subtrigonum amplexente, 10-lobulato, margine incrassato, staminibus 10 in serie duplici, 6-8 vel 8-10 mm. longis. Flore ♀ ignoto. Capsula submatura ad 12-15 mm. magna, viva videtur globulosa, epicarpio sat tenui, semine haud optime maturo scaraboeo, haud appanato basi ambitu paulo rotundato-inilato, inde seminis ipsius lateribus primo intuitu haud parallelis, 9 mm. longo, 7-9 mm. lato.

ARIZONA. Santa Catalina Mountains, *Lemmon s.n.*, Aug. 1883 (HOLOTYPE, US; isotype, UC); same locality, "Stony slope along Soldier's Canyon Trail, Soldier's Canyon." *Thorner s.n.*, 1910 (UA); same locality, The Basin, *Harris 16475* (US, NY); same locality, *Livingstons & Thorner s.n.*, Carillos Ranch, Nov. 1906 (UA); same locality, Sabino Canyon Trail, *Livingstons & Thorner s.n.*, 1908 (4 sheets, UA); Baboquivari Mts., *Peebles 8796*, 1932 (US).

The leaf of this plant is essentially different from that of *M. angustiloba* Muell. Arg. In *M. Davisiae* the leaf-lobes are dilated into 2 or 3 lobules, the apical lobule being especially noticeable; in *M. angustiloba*, on the contrary, the leaf-lobes are essentially linear or linear-acuminate in their general outline, being more or less irregularly lobulate only towards the base. This constant vegetative difference bespeaks in itself a specific difference which is so important as to remove *M. Davisiae* to an affinity (*M. chlorosticta*, as it seems) other than that of *M. angustiloba* (*M. mexicana*). In addition the two species differ in the seed. *Harrison & Kearney 8904* has a seed which is perfectly comparable to that of *Lemmon s.n.*, the holotype of *M. Davisiae*. The characters are: seed of *M. angustiloba*, 12 mm. long, 10 mm. broad, nearly oval in outline; seed of *M. Davisiae*, 9 mm. long, 7 to 9 mm. broad.

*Manihot Davisiae* has apparently the status of a relic-species, narrowly localized in the Santa Catalina Mountains, the classic locality, perhaps occurring much less frequently on the Baboquivari Mountains, the lowlands in this region being occupied by *M. angustiloba*. The distribution of these two entities would seem to follow altitudinal lines.

The specific epithet is for Mrs. Mary D. Davis of Tucson, Arizona, to whom I am indebted for data in connection with my work on this species.

At this writing, another *Manihot* sp. nov. from the range considered in this paper is in manuscript, ready for the press. This new species will be published by the Bulletin of the Torrey Club in the immediate future.

## HEDYOTIS LINNAEUS VERSUS OLDENLANDIA LINNAEUS AND THE STATUS OF HEDYOTIS LANCEA THUNBERG IN RELATION TO H. CONSANGUINEA HANCE

E. D. MERRILL AND F. P. METCALF

*With one plate*

ALL botanists familiar with any considerable number of species placed under the generic names *Hedyotis* and *Oldenlandia* realize that, because of intergrading forms, or because certain specimens lack either flowers or fruits, it is often very difficult to separate the two genera with any degree of certainty. Many still recognize both generic names, while some would solve the problem by raising minor groups of both *Hedyotis* and *Oldenlandia* to generic status. Thus, if Bremekamp's criteria as to the delimitation of rubiaceous genera be applied to the group under discussion, it is not improbable that both *Hedyotis* and *Oldenlandia* might be retained, with, perhaps, a rather limited series of species in each, and many species now currently placed under one or the other transferred to other generic names. This being a possible contingency, while we believe that *Hedyotis* should be retained and *Oldenlandia* treated as a synonym, and that in this case a more or less "collective" genus is preferable to numerous smaller and often weak genera, we do not feel that the time has come to make wholesale transfers of *Oldenlandia* species to *Hedyotis*.

In 1891, both Otto Kuntze and K. Schumann accepted *Oldenlandia* as the proper generic name and transferred to the former many species originally described under *Hedyotis*. They, however, were working under the rule of strict priority, *Oldenlandia* having been described in 1737 while *Hedyotis* was not proposed until ten years later, both, of course, previous to the establishment of the binomial system in 1753. In 1753, Linnaeus recognized *Oldenlandia* with four and *Hedyotis* with three species. The present provisions of the International Code appertaining to the case were not in force in 1891.

It is suspected that a considerable number of botanists concerned with species in this group have more or less automatically accepted Kuntze's and Schumann's conclusions, for currently many species of *Hedyotis* are still being transferred to *Oldenlandia*. However, the provisions of the International Code of Botanical Nomenclature are clear that in cases of this kind, where two genera are united, the name that should be accepted is that selected by the individual who first combined the two groups. Lamarck and Sir James E. Smith both combined the two genera long before similar action was taken by Kuntze and by Schumann, and both selected *Hedyotis* in preference to *Oldenlandia*. In discussing the case in 1811, Smith (Rees Cyclop. 17: 1811) states: "Schreber advises their union, Gen. Pl. 820

[1791], and Lamarck, although he had previously described and figured them as distinct, finally in the letter-press to his plates, sinks *Oldenlandia* in *Hedyotis*." Lamarck is thus the first botanist to combine the two genera (Tabl. Encycl. 1: 262-272, 1791), and he, as did Smith in 1811, accepted *Hedyotis* and transferred all the Linnean species of *Oldenlandia* to the former. He states: "Nous reunissons ici les Oldenlandes & les Hédýotes, parce qu'elles nous paroissent véritablement congénères," and before his conspectus of the species adds: "Huc Oldenlandias & Hedyotides Linnaei conjungimus; nobis enim videntur omnino congeneres." We have, thus, a very clear case, for those who elect to follow the spirit and provisions of the International Code, in that if the two genera be combined *Hedyotis* Linn. must be accepted in preference to *Oldenlandia* Linn.

Through the kindness of Dr. C. G. Alm of the Botanical Garden and University Museum, Upsala, Sweden, we have been fortunate in obtaining photographs of the types of *Hedyotis lancea* Thunb.  $\beta$  and *Hedyotis lancea* Thunb.  $\alpha$ ; the former, from Macao, is the holotype of *Hedyotis lancea* Thunb. ex Maxim. as described in 1883. The latter is represented by a Madagascar specimen collected by Oldenburg, which was not cited by Maximowicz, as it represents a different species with which students of the Chinese flora are not concerned.

It seems to be apparent that the Kwangtung *Hedyotis lancea* Thunb. ex Maxim., described from a Macao specimen collected by *Bladh*, has been misinterpreted. We believe that the material referred here by Dunn and Tutcher, other than the original Macao specimen which they did not see, does not represent Thunberg's species.

Judging from the photograph of the holotype and the characters as given in the original description, *Hedyotis lancea* Thunb. ex Maxim. seems to be identical with *Hedyotis consanguinea* Hance. There are two authentic specimens of *Hance* 978 from Whampoa available for study, one in the Gray Herbarium and the other in the Britton Herbarium, New York Botanical Garden. Neither of these represents the actual type collection, for the one in the Britton Herbarium was collected in April 1862, and the one in the Gray Herbarium was collected in April 1866, four years after Hance's description was published. Hance's type, the original of his no. 978, was collected at Whampoa in May, the year not indicated by him, but clearly earlier than 1862; thus the specimens of *Hance* 978 in the Gray and Britton herbaria represent re-collections of the species from the type locality. The description was actually published in Paris in the latter part of 1862. From these specimens of *Hance* 978 we are unable to distinguish *Hedyotis lancea* Thunb. ex Maxim. The latter may have been named before the close of the eighteenth century, but no description of it was published until 1863 when Maximowicz examined *Bladh's* Macao specimen in Thunberg's herbarium on which his description is wholly based.

Numerous southern China specimens formerly placed as representing *Hedyotis lancea* Thunb. ex Maxim. apparently represent undescribed forms, which are considered below.



1. *Hedyotis consanguinea* Hance, Ann. Sci. Nat. IV. Bot. **18**: 221. 1862; Maxim. Bull. Acad. Sci. St. Pétersb. **29**: 162. 1883; Mém. Biol. **11**: 782. 1883; Dunn & Tutcher, Kew Bull. Add. Ser. **10**: 127. 1912 (Fl. Kwangtung and Hongkong). *Oldenlandia consanguinea* O. Kuntze, Rev. Gen. Pl. **1**: 292. 1891. *Hedyotis lancea* Thunberg ex Maxim. Bull. Acad. Sci. St. Pétersb. **29**: 161. 1883, Mém. Biol. **11**: 780. 1883, syn. nov. *Oldenlandia lancea* O. Kuntze, Rev. Gen. Pl. **1**: 292. 1891, syn. nov.

KWANGTUNG: Whampoa, *Hance* 978, April 1862, topotype of *H. consanguinea* Hance (N); same locality, *Hance* 978, April 1866 (G) and *Hance s.n.* (N); Macao, *Bladh* in herb. Thunberg, type of *H. lancea* Thunberg ex Maxim. (photograph A); China, "Rec'd. from Mr. Baird, Oct. 1829" (G).

2. *Hedyotis caudatifolia* sp. nov.

*Hedyotis lancea sensu* Dunn & Tutcher, Kew Bull. Add. Ser. **10**: 127. 1912, *pro parte*, non Thunberg ex Maxim.

Frutex erectus, glaber, circiter 0.5 m. altus, caudex lignosus; ramis cinereis vel albido-cinereis, teretibus, internodiis brevibus, ramulis viridibus, glabris, leviter striatis, ultimis circiter 1 mm. diametro; foliis plerumque lanceolatis, glabris, coriaceis, supra viridibus, subtus pallidioribus, 8–15 cm. longis, 1.5–2.5 cm. latis, sursum gradatim angustatis, caudato-acuminatis, basi cuneatis vel decurrento-acuminatis; nervis primariis utrinque circiter 4, gracilibus, acute adscendentibus, obscuris; petiolo 10–15 mm. longo, glabro; stipulis late ovatis, acutis vel abrupte acuminatis, margine minute glanduloso-serratis, haud laciniatis; inflorescentiis terminalibus, elongatis, paniculatis, glabris, multifloris, 7–15 cm. longis, deorsum plus minusque foliatis, ramis inferioribus 3–5 cm. longis, superioribus brevioribus; floribus cymosim dispositis, plerumque in triadibus in ramulis ultimis dispositis, breviter pedicellatis; calycis tubo ovoideo, 1.5 mm. longo, glabro, lobis 5, anguste lanceolatis, 0.5–0.75 mm. longis; corollae tubo cylindrico 4–5 mm. longo, extus glabro, intus puberulo, ore leviter barbato, lobis oblongo-lanceolatis, 1.5 mm. longis; staminibus 4, exsertis; capsulis septicide dehiscentibus, glabris, cum lobis calycinis persistentibus 4 mm. longis, et 2 mm. diametro.

KWANGTUNG: Ting Wu Shan, *W. Y. Chun* 6361, 6368, 6385 (TYPE), May 5, 1928 (all A), *Mell* 209, March 1918 (A), *CCC* 6379 (*Buswell, Levine & To*), April 15, 1921 (N), *S. Y. Lau* 20188, July 1932 (N); Sun-wui district, *Tso & Tsiang* 2001, April 11, 1928 (A, N); Loh Fau Mt., *Merrill* 10689, Aug. 9–27, 1917 (N); *T. M. Tsui* 29, March–April 1932 (A, N); Chung Shan, Nga Iu Mt., *LU* 19253 (*Tsang*), April 25, 1931 (N); Ah P'o Kai Shan, Sin-fung district, *Y. W. Taam* 628, May 1938 (A); Naam Kwan Shan, Lung-moon district, *W. T. Tsang* 25321, June 1935 (A); Sam Kok Shan, Ts'ung-hua district, *W. T. Tsang* 25096, May 1935 (A); Nam Shan, Ho-yuen district, *W. T. Tsang* 28645, 28727, 28747A, April–May 1938 (A). KWANGSI: Shap Man Taai Shan, Shangsze district, *W. T. Tsang* 22033, 22389, 22465, April, May and June 1933, 2nd Kwangsi expedition (all A); *W. T. Tsang* 24170, Sept. 1934, 4th Kwangsi expedition (A, N); Tong Shan, Waitsap district, *W. T. Tsang* 22712, Sept. 5, 1933, 3rd Kwangsi expedition (G); Seh-feng Dar Shan, S. Nanning, *R. C. Ching* 8101, Oct. 21, 1928 (A); Yao-shan, Ping Nan, *C. Wang* 39134, May 8, 1936 (A).

These specimens were for the most part determined and distributed as representing *Hedyotis lancea* Thunberg. As noted above, true *Hedyotis lancea* Thunberg is a synonym of the distinctly different and apparently rare *Hedyotis consanguinea* Hance. Our species is decidedly woody at the base, and is a much larger and more vigorous plant with distinctly petioled and larger leaves than typical *H. consanguinea* Hance; it is not very closely related to the latter, from which it can readily be distinguished also by its large and more abundantly flowered terminal inflorescences.

3. *Hedyotis minutopuberula* sp. nov.

*Hedyotis lancea* sensu Tanaka & Odashima, Jour. Soc. Trop. Agric. **10**: 382. 1938 (Contrib. Hort. Inst. Taihoku Imp. Univ. No. 24) non Thunb. ex Maxim.

Herbacea vel suffruticosa ad 0.5 m. alta; ramis et ramulis et inflorescentiis obscurissime minute puberulis, ramis teretibus; foliis submembranaceis utrinque viridibus, plerumque ovatis vel oblongo-ovatis, 3.5–5 cm. longis, 1.5–2 cm. latis, acutis vel obscure acuminatis, basi cuneatis vel decurrento-acuminatis, supra glabris, subtus subglabris vel minute puberulis; nervis primariis utrinque 3, gracilibus, acute adscendentibus, obscuris; petiolo 4–8 mm. longo, minute puberulo; stipulis ovatis vel lanceolatis, minute puberulis, caudatis vel attenuatis, 2–5 mm. longis, margine minute glanduloso-serratis; inflorescentiis terminalibus, cymoso-paniculatis, minute puberulis glabrescentibus, e basi ramosis, ramis primariis paucis, inferioribus ad 4 cm. longis; floribus numerosis in ramis primariis secundariisque racemoso-cymosim dispositis, pedicellatis; calycis tubo obovoideo, 1 mm. longo, minute puberulo, lobis acuminatis, lanceolatis, 1.5 mm. longis, persistentibus sub fructu ad 2.5 mm. longis; corollae tubo extus glabro, intus puberulo, ore barbato, lobis subovatis, 1 mm. longis; staminibus ad basim tubi corollae insertis; capsulis subglobosis vel obovoideis, minute puberulis vel glabris, 2 mm. longis, 1.5 mm. latis, septicide dehiscentibus.

HAINAN: Po-ting, F. C. How 73014 (TYPE, A), June 28, 1935, in thickets, the flowers said to be purplish red.

This specimen was tentatively referred to *Hedyotis lancea* Thunberg, but it is easily separated from both *Hedyotis consanguinea* Hance (*H. lancea* Thunberg ex Maxim.) and *Hedyotis caudatifolia* Merr. & Metc. by the minutely puberulent and obscure indumentum, the differently shaped leaves, very different inflorescences and different floral and fruit characters.

4. *Hedyotis longiexserta* sp. nov.

Herbacea vel suffruticosa e basi lignosa, stricte erecta, eramosa, glabra, ad 0.5 m. alta; caulibus teretibus, laevibus, deorsum 2.5 mm. diametro, sursum gracilioribus, internodiis inferioribus 2.5–4 cm., intermediis ad 15 cm. longis; foliis paucis, lanceolatis vel oblongo-lanceolatis, 5–7 cm. longis, 1–1.5 cm. latis, acuminatis vel acutis, basi late cuneatis vel obtusis, supra viridibus, subtus paullo pallidioribus; nervis primariis utrinque 3, obscurissimis vel cum reticulis subobsoletis; petiolo 3–5 mm. longo; stipulis late ovatis, inter foliis plus minusve connatis, circiter 3 mm. longis, abrupte et breviter apiculatis, margine integris, admodum obscure glandulosis; inflorescentiis terminalibus longissime exsertis, paniculatis, ad 20 cm. longis et 7 cm. latis, ramulis primariis racemosim dispositis, oppositis, distantibus, inferioribus ad 4 cm. longis, omnibus deorsum nudis, sursum cymosim ramulosis, bracteis linearibus, inferioribus ad 12 mm. longis, subpatulis; floribus albis, pedicellatis vel subsessilibus, calycis tubo ovoideo, glabro, 1 mm. longo, lobis triangulari-ovatis, acutis, vix 0.5 mm. longis; corollae tubo 1.5 mm. longo, extus glabro, intus dense barbellato, lobis late ovatis, rotundatis; capsulis plerumque oblongo-obovoideis, 2–2.5 mm. longis, 1.5 mm. diametro, septicide dehiscentibus.

KWANGSI: Shap Man Taai Shan, near Hoh Lung village, Shangsze district, W. T. Tsang 22574 (TYPE, A), June 27, 1933, 2nd Kwangsi Expedition, in meadows, flowers white, local name, *Tsak Ve Tan*.

The specimen on which this description is based was originally referred

to *Hedyotis lancea* Thunberg ex Maxim. but is totally unrelated to that species, being characterized by its very few leaves, these mostly two or three pairs near the basal parts of the stems, the upper pair or few pairs being separated by very long internodes, and its long exserted panicles composed of few, distant, somewhat spreading, primary branches which are naked for two-thirds to three-fourths of their length, the flowers being cymosely arranged at the ends of these primary branches.

#### EXPLANATION OF PLATE

- Fig. A. Portion of the holotype of *Hedyotis lancea* Thunb. ex Maxim. in herb. Thunberg; i.e. the *Bladh* specimen from Macao labelled by Thunberg *Hedyotis lancea*.
- Fig. B. Topotype of *Hedyotis consanguinea* Hance, *Hance* 978 in herb. Gray, Whampoa, April 1866 (this is not the type collection, which was made in or before 1862, but merely represents a re-collection of the species by Hance from the type locality four years after his description was published).

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A. *HEDYOTIS LANCEA* Thunberg



B. *HEDYOTIS CONSANGUINEA* Hance



STUDIES IN THE THEACEAE, XI  
KILLIPIODENDRON

CLARENCE E. KOBUSKI

IN SEPTEMBER 1941, a specimen of Theaceae collected by J. Cuatrecasas in Colombia was brought to my attention for determination. At first it appeared to be a new species of *Freziera*, an annoying situation, since my recent synopsis of the genus was already in page-proof. Upon dissection, the floral structure agreed very well with *Freziera* in most respects. The ovary was five-celled, a character not too unusual in *Freziera*, but the individual loculi apparently possessed very few ovules. A cross-section of an immature fruit showed only two developing seeds. This ovule and seed condition was so contrary to all species of *Freziera* hitherto examined that a request for more ample material was dispatched to the collector. Recently, fruiting material of the same collection has been received. The mature fruit proves to be a fleshy berry rather than a thin-shelled capsule and develops only five ellipsoidal seeds rather than the hundreds of tiny reniform seeds typical of *Freziera*. These amazing differences in ovary, fruit and seeds form the basic characters for *Killipiodendron*.

It is a pleasure to dedicate this new genus to Mr. E. P. Killip of the United States National Museum at Washington, D. C., whose interest and outstanding work on the flora of Colombia are well known to all students of the South American flora.

**Killipiodendron**, gen. nov.

Flores dioeci. Sepala 5, quincuncialiter imbricata, persistentia, pergamentacea, margine scariosa (non glanduloso-denticulata). Petala 5, sepalis alterna, basi ima coalita, in aestivatione imbricata. Flores staminati non visi. Flores pistillati: Staminodia uniseriata, antheris plane deficientibus. Ovarium liberum, sensim in stylum attenuatum, 5-loculare; ovula in quoque loculo 2, placentae in loculum medium intrusae affixae; stigmata 5-partita. Fructus baccatus. Semen in quoque loculo solitarius (6-7 mm. longus et 2-4 mm. diametro), ellipticus.

Arbor ramis alternis. Folia disticha alterna, serrato-crenata. Flores in axillis foliorum. 1-pauci-fasciculati, pedunculis basi bracteatis, apice bracteolas 2 persistentes gerentibus.

TYPE SPECIES: *Killipiodendron colombianum* Kobuski.

**Killipiodendron colombianum**, sp. nov.

Arbor ramulis griseo-brunneis rugosis villosis subflexuosis. Folia oblongo-ovata, crasso-coriacea, rugosa, disticha, 14-17 cm. longa et 5-6 cm. lata, supra glabrescentia (juvenilia dense villosa), subtus ferrugineo-villosa praesertim in costa venisque elevatis, apice acuta, basi aequalia et subrotundata, margine denticulata subrevoluta, costa profunde canaliculata (ad

2 mm. diam.), venis  $30^+$  paribus cum venulis profunde impressis, petiolis 2–3 cm. longis et 3–4 mm. diam. dense pubescentibus alatis, alis ad 2 mm. latis. Flores axillares, 2–3-fasciculati, in ramulis florigeris valde abbreviatis; pedicelli hirsuti, crassi, ca. 5 mm. longi, apice bracteolis 2 crassis, ovatis vel subrotundatis, concavis, 6–7 mm. longis et 5–6 mm. latis; sepala 5, imbricata, ca. 5 mm. longa et 5–6 mm. lata, pergamentacea, concava, rotundata vel ovata, margine scariosa, villosa, exteriora magis pubescentia; petala 5, imbricata, glabra, alba, subpergamentacea, ovata, ca. 6 mm. longa et 4–5 mm. lata, apice subacuminata; staminodia ca. 25, uniseriata; ovarium conicum, glabrum, ca. 3 mm. longum et 3 mm. diam., apice per stylum in stigma 5-partitum attenuatum, 5-loculare, loculis (ut videtur) 2-ovulatis. Fructus baccatus, globosus, niger, ca. 1 cm. plusve diam., 5-spermus; semina 5–7 mm. longa et 2–4 mm. lata, ellipsoidea, dorso convexa, ventre acuta.

DISTRIBUTION: South America (Colombia).

COLOMBIA: Dept. Huila, Cordillera Oriental, western slope between Gabinete and Andalusia, alt. 2200–2300 m., *J. Cuatrecasas* 8582 (TYPE, AA; isotype, US), March 24, 1940 (tree with distichous, coriaceous leaves; flowers white; fruit black).

The leaf-characters are very outstanding in this species. Very heavily coriaceous, the leaves are traced on the upper surface by a deeply channelled midrib and deeply impressed veins ( $30^+$  pairs) as well as sharply defined cross-veins. On the very young leaves a ferrugineous pubescence covers the upper surface and persists on the upper midrib of some of the older leaves. Otherwise, the leaves are glabrescent above. The lower surface is invested over all with a ferrugineous villous pubescence and the veins, including the secondary and cross-veins, are highly elevated. The petiole is 2–3 cm. long and 3–4 mm. in diameter, winged, with the wings up to 2 mm. wide. The leaf-scars, along with the abbreviated flowering stem, cause the branchlets to appear subflexuose.

The bracteoles are densely pubescent, somewhat longer than the calyxlobes and about equally as wide. There seems to be a gradation in the density of pubescence from the bracteoles to the inner lobes of the sepals. The ovary, fruit and seeds have been discussed in the early portion of this paper.

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## PLANTAE PAPUANAE ARCHBOLDIANAE, IX\*

E. D. MERRILL AND L. M. PERRY

THIS paper covers the Myrtaceae (excluding *Octamyrtus* Diels, and a few incomplete specimens) of the Archbold Expeditions' collections not included in Mr. C. T. White's paper published in the last issue of this Journal, which was largely limited to a consideration of those genera characterized by having dry dehiscent fruits. Our work has been greatly handicapped owing to the unavailability of type-material, the consequent necessity of making our determinations from descriptions alone, and the large number of species already reported from New Guinea. The genera represented in these extensive and varied collections are *Decaspermum*, *Myrtus*, *Xanthomyrtus*, *Eugenia*, *Acmena*, *Syzygium*, and *Cleistocalyx*; of the latter genus only a single collection, *C. Bacuerlenii* (F. v. Muell.) Merr. & Perry, is represented, this from the type-region. In this work, we have again learned that mature fruit is more necessary than flowers for reasonably sure generic determination.

***Decaspermum* J. R. & G. Forster**

Diels, who has done more work on *Decaspermum* J. R. & G. Forst. than any other botanist except Blume, has indicated more than once the need of a monograph of this genus. Until such a study appears, with a fairly detailed evaluation of the essential characters, a certain amount of confusion and duplication in species is inevitable. We have at hand sufficient material to note the variation in characters, but not enough to ascertain the limits of such variation; we have found, however, that the number of locules characteristic of a single species appears more variable than is indicated in one key to the genus. On account of the limited authentic material and the lack of types for comparison, we have tried, wherever possible, to fit the collections, even if somewhat loosely on occasion, into the species already described from New Guinea.

***Decaspermum neurophyllum* Lauterb. & K. Schum. var. *leve* var. nov.**

A forma typica differt ramulis parce crispe pubescentibus, foliis fere glabris supra nitidis, venis primariis prominulis sed non prominentibus, inflorescentiae axi ramulisque parce tomentellis.

NETHERLANDS NEW GUINEA: Hollandia, *Brass* 8899 (TYPE of var.), June 1938, alt. 20 m., common in seral growths of a gravelly river-bed (small tree; flowers pink; fruit soft, black).

In this collection, although the primary veins of the leaves are readily observed, they are not impressed above and not nearly so prominent on the lower surface as in the species (represented in the material at hand by

\*Botanical Results of the Richard Archbold Expeditions. See Jour. Arnold Arb. 22: 529-542, 1941.

*Brass* 4822, 4822.A, 5330 from British New Guinea, and *Clemens* 149, *Kanehira* 4025, 4040, *Schlechter* 17496 from Northeastern New Guinea); the pubescence of the branchlets and of the inflorescence is short and somewhat crisp but sparser than in the collections representing *Decaspermum neurophyllum* Lauterb. & K. Schum. There seems to be little difference in the flowers or fruit. The ovary is 7- or 8-loculed, but 7-loculed flowers were also found in *Schlechter* 17496, which clearly represents the species.

***Decaspermum Coriandri*** (Bl.) Diels, Bot. Jahrb. **57**: 372. 1922, vel aff.

*Nelitris Coriandri* Bl. Mus. Bot. Lugd.-Bat. **1**: 74. 1849.

BRITISH NEW GUINEA: Central Division, Kubuna, *Brass* 5601, December 1933, alt. 100 m., rain-forest (slender small tree; flowers pale yellow with purple stamens). SOLOMON ISLANDS: Ysabel: Tataba, *Brass* 3429, 3526, January 1933, alt. 50 m., rain-forest ridges (small tree; leaves shining, the midrib pale and the margins slightly recurved; petals and stamens pink).

We are not wholly sure that the Solomon Islands material is conspecific with the New Guinea specimens; the primary veins of the leaves are slightly more manifest than in *Warburg* 20417 (identified by Diels as *Decaspermum Coriandri* (Bl.) Diels). The species has been reported only from New Guinea.

***Decaspermum nitentifolium*** sp. nov.

Frutex vel arbuscula 1-3 m. alta; ramis glabris cinereis, ramulis novellis villosulis; foliis novellis albido-pilosis cito glabris petiolatis, petiolo 2-3 mm. longo, lamina coriacea, ovato-elliptica, 2-5 cm. longa 1.2-3 cm. lata, basi rotundata vel obtusa apice subabrupte breviter acuminata, supra nitida minute punctulata subtus opaca minute glandulosa, venis primariis ac vena intramarginali inconspicuis; inflorescentiis terminalibus ac in axillis foliorum superiorum dispositis folium aequantibus vel paullo superantibus; bracteis foliaceis, ramulis pedicellisque  $\pm$  pubescentibus; calycis tubo 1 mm. longo  $\pm$  piloso, lobis 1 mm. longis, triangularibus obtusis parce pilosis vel glabris; petalis 3 mm. longis orbicularibus vel late ellipticis; ovario 7-loculari.

NETHERLANDS NEW GUINEA: Balim River, *Brass* 11643 (TYPE), December 1938, alt. 1600 m., common in low bushy second growths on rocky slopes (shrub or tree 1-3 m. high; petals white; filaments pink).

On account of the shining leaves (upper surface) we should have preferred to place this collection in *Decaspermum nitidum* Lauterb.; but, in our material the leaves are ovate-elliptic with a rounded base rather than oblong with an acute base; the new branchlets are loosely short-villous though quickly glabrate, and the sepals have very few hairs on the outer surface. These are perhaps all variable characters, yet, owing to the lack of agreement in so many points, we do not believe the collection is conspecific with *D. nitidum* Lauterb.

***Decaspermum belense*** sp. nov.

Arbor 14 m. alta; ramis cinereis ramulis novellis villosulis cito tomentellis; foliis petiolatis, petiolo 3 mm. longo; lamina 3-6 cm. longa 1.3-2 cm. lata, lanceolata apice acuminata basi obtusa vel cuneata supra in sicco olivacea nitida subtus pallidiore opaca novella parce villosula maturitate glabra vel subtus consperse pilosa, venis primariis utrinque distincte

manifestis non prominulis; inflorescentiis axillaribus terminalibusque folium paullo superantibus, bracteis foliaceis, ramulis pedicellisque tomentellis; calycis tubo 1 mm. longo  $\pm$  cinereo-pubescente, lobis 1 mm. longis, triangularibus glabris vel interdum parce pubescentibus; petalis 3 mm. longis, 2 mm. latis; ovario 5-loculari.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh 11135* (TYPE), November 1938, alt. 2380 m., occasional in primary forest (tree 14 m. high, 40 cm. diameter; crown small; bark brown, scaly; flowers white; fruit green).

This species suggests both *Decaspermum nitidum* Lauterb. and *D. leptanthelium* Diels. From the former it is distinguished by the obviously pubescent new growth, and fewer-loculed ovary. It differs from the latter in its coriaceous leaves, and longer, more copiously flowered panicles.

***Decaspermum exiguum* sp. nov.**

Arbuscula gracilis; ramulis novellis tomentellis; foliis novellis sericeis deinde glabris demum supra glabris vel costa minute pilosa, in sicco fuscis, subtus glabris vel parce pilosis pallidioribus, petiolatis, petiolo breve 1-1.5 mm. longo, pubescente vel glabrato, lamina coriacea 1.4-4 cm. longa 0.8-1.3 cm. lata, lanceolata basi late cuneata vel obtusa apice anguste acuta vel subacuminata, nervis, costa excepta, obscuris; inflorescentiis terminalibus ac in axillis foliorum superiorum dispositis folia paullo superantibus, axi ramulis pedicellisque molliter breviter villosis vel subtomentellis; bracteis foliaceis; calycis tubo sericeo-villosulo 1 mm. longo, lobis 1 mm. longis anguste triangularibus acutiusculis  $\pm$  pilosulis; petalis  $\pm$  3-4 mm. longis ciliolatis; ovario 5-loculari; fructu subdepresso-globoso.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, *Brass 4836* (TYPE), August 1933, alt. 2400 m., common in ridge-top forests (tall slender trunk with compact flattened crown; petals cream-colored; filaments pink; fruit immature).

In the leaf-outline and the short petiole this species approaches *Decaspermum Raymundii* Diels from Palau, but the leaves are coriaceous and their nerves with the exception of the midrib are obscure, also the flowers are a little smaller. Among New Guinean species *D. exiguum* is probably nearest to *D. nitidum* Lauterb. The latter, however, according to the description, is a more nearly glabrous species.

***Decaspermum Forbesii* Bak. f. Jour. Bot. 61: Suppl. 14. 1923.**

BRITISH NEW GUINEA: Central Division, Wharton Range, Murray Pass, *Brass 4523*, July 1933, alt. 2840 m., common in forests (shapely tree 4-5 m.; leaves glossy above; petals cream-colored; immature fruit purple); same locality, *Brass 4543* (much branched thick-foliaged tree 5-6 m.; petals cream-colored; filaments purple; fruit black, slightly depressed; seeds red); Mt. Tafa, *Brass 4899*, August 1933, alt. 2400 m., plentiful in ridge-crest forests (tree 8-12 m. high; leaves glossy; petals white; filaments pink; fruit dark purple).

These three collections are too much like the description of *Decaspermum Forbesii* Bak. f. to be placed elsewhere without actual comparison with the type; yet, it is to be noted that the branchlets are clothed with a white somewhat shaggy pubescence, and the calyx-lobes are scarcely acute. In *Brass 4899* the leaves are more elliptic than ovate, 7-12 mm. long, 5-8 mm. wide, almost equally narrowed toward the base and the apex. Probably also belonging to this species is *Brass 4541* from Murray Pass, alt. 2840 m.

(virgate tree 3–5 m.; leaves pale and shining; petals cream-colored; filaments purple; fruit soft, black; seeds red). The leaves are 8–10 mm. long, 5–8 mm. wide; the ovary is 4-loculed.

***Decaspermum simile* sp. nov.**

Ut videtur arbor parva; ramulis atrofuscis, ramulis novellis pubescentibus vel tomentellis; foliis novellis praecipue costa margineque albido-pubescentibus cito glabris breviter petiolatis, petiolo vix 1 mm. longo, lamina 7–20 mm. longa 4–12 mm. lata, ovato-elliptica vel lanceolata apice acuta basi rotundata vel obtusa interdum cuneata margine leviter recurvata, in sicco supra atrofusca subtus pallidiore crebre minuteque glandulosa, costa supra impressa subtus prominula, nervis primariis inconspicue manifestis vel interdum obscuris; inflorescentiis terminalibus axillaribusque, pedicellis ramulisque tomentellis vel pubescentibus, bracteis foliaceis; calycis tubo  $\pm$  sericeo sub limbo leviter constricto, 1–1.4 mm. longo, lobis 1.5 mm. longis, subellipticis vel rotundatis; petalis 4–5 mm. longis 3 mm. latis; ovario 5–6-loculari.

NORTHEASTERN NEW GUINEA: Sarawaket, *Clemens* 5563, 5666a, 5575 (TYPE), March 1937, alt. 2400–2700 m.; Buni Tamunac Camp, *Clemens* 5303, January 1937, alt. 2100–2400 m.

*Decaspermum simile* is closely allied to *D. Forbesii* Bak. f., but differs in the short rather than shaggy pubescence of the younger branchlets and the inflorescence; the pubescence of the calyx-tube is not so copious and is more appressed than in the latter species, and the calyx-lobes are distinctly rounded.

***Decaspermum nivale* (Ridley) comb. nov.**

*Myrtus nivalis* Ridl. Trans. Linn. Soc. Bot. II. **9**: 42. 1916.

*Decaspermum humifusum* Diels, Bot. Jahrb. **57**: 371. 1922, Nov. Guin. **14**: 88. 1924.

NETHERLANDS NEW GUINEA: Utaqua River to Mt. Carstenz, Camps X to XI, Kloss (phot. of type, and a very small fragment); Lake Habbema, *Brass* 9479, August 1938, alt. 3225 m., covering a precipitous rock face (habit prostrate; leaves smooth and shining; flowers white; fruit black, fleshy); 11 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9734, 9810, September 1938, alt. 3400 m., alpine grassland (prostrate shrub covering sandy banks of stream; flowers white; fruit black and fleshy); 9 km. northeast of Lake Habbema, *Brass* 10921, October 1938, alt. 2800 m., very abundant on an old landslip (prostrate shrub; flowers white; plant usually sterile).

Although there is considerable variation in the size of the leaves (2–6  $\times$  1.5–4 mm.), the number of stamens (15–30 in different collections), and the number of locules in the ovary (4–7, mostly 6 or 7), we believe the material all belongs to a single species. In the fragment of the type (a single leaf and flower just past anthesis) the leaf is 6 mm. long and 3 mm. wide, and the ovary is 6-loculed. When Diels described *Decaspermum humifusum* he had only Ridley's description as a working basis, and since he stressed the number of locules in the ovary (a character not mentioned by Ridley), it is easy to understand why he was at a loss to place Ridley's species.

Either conspecific or closely resembling this species is *Clemens* 5895 from Sarawaket, Northeastern New Guinea; the leaves (4–8 mm.  $\times$  2.2–5 mm.) tend to be ovate-elliptic and somewhat acute.



### **Myrtus** Linnaeus

In the various reports on the Flora of New Guinea as many as nine species of *Myrtus* L., in its broader sense, have been attributed to the island. Three of these belong to *Dccaspermum* J. R. & G. Forst., the rest are included in *Xanthomyrtus* Diels. A brief consideration of the published species of *Myrtus* L. is sufficient to show that the generic concept is either limited or inclusive depending upon the opinion of the individual worker. The collections at hand contain four species belonging to the complex. The flowers of two of these, in general characters, agree well with those of *Myrtus communis* L., the type-species of the genus. The flowers of the other two diverge somewhat in the stamen-characters; here, the stamens are short, not inflexed in the bud, the filaments vary in length and sometimes in size, the outer being the larger, the anthers are basifixed, the broad connective is continuous with the filament and, in addition, projects beyond the anther-sacs as much as 0.4 mm., causing them to appear lateral rather than apical as in most species of *Myrtus* L. We have scanned the literature and the available related material in an effort to discover whether such a difference has been noted before and if it might be considered a constant character. Among the specimens from New Caledonia are four species with the connective produced in varying degrees beyond the anther-sacs: *M. artensis* Beauv. & Guill., *M. nekouana* Guill., *M. emarginata* Panch. (i.e., part of the material so labeled, for we have no way of telling what the original was, all the specimens have been named in Paris), and *M. cinerea* Brongn. & Gris. In Guillaumin's latest revision of the Myrtaceae with fleshy fruits, Bull. Soc. Bot. France **85**: 626-653. 1938, this character of the elongated connective appears in the key to the species of *Myrtus* of New Caledonia and in the descriptions of some new species. This prolongation of the connective suggests a similarity with the American genus *Ugni* Turcz. Professor I. W. Bailey has very kindly examined the wood-structure and the stamens of the various species under consideration and he finds that *Ugni* Turcz. is differentiated from the other genera in the wood-structure and in having a single gland at the apex of the connective (all the others have glands in varying numbers over the dorsal part of the connective). In view of the variation within the group and the lack of sufficient material and time to make a comprehensive survey of *Myrtus* L. for generic and sectional lines, at present we believe it best simply to describe these four species from New Guinea as representing the genus *Myrtus* L.

#### **Myrtus Randiana** sp. nov.

Arbor parva dense foliata; ramis teretibus atrocinereis; ramulis brunnescentibus tenuibus 4-angulatis angustissime alatis; foliis glabris chartaceis copiose minuteque pellucido-punctatis lanceolatis, 4-6 cm. longis 0.8-1.1 cm. latis, basi acutis vel anguste cuneatis, apice obtuse elongato-acuminatis vel subrostratis abrupte apiculatis, costa utrinque prominula, venis primariis utrinsecus 6-11 subirregulariter dispositis utrinque subaequaliter manifestis, reticulis submanifestis, vena intramarginali 0.5 mm. a margine distante; petiolo  $\pm$  2 mm. longo; floribus axillaribus solitariis vel 2-4-

fasciculatis; pedunculis 1.5–2 cm. longis, tenuissimis apice bibracteatis, bracteis linearibus caducis; floribus non visis; fructibus crebre minuteque glandulosis subglobosis  $\pm$  5 mm. diametro calycis lobis coronatis; lobis 4 circiter 1 mm. longis obtusis; petalis . . . ; staminibus  $\pm$  3 mm. longis, filamentis filiformibus, antheris versatilibus late ovatis vix 0.4 mm. longis, connectivo apice glanduloso; disco staminifero angusto puberulo; ovario biloculari, ovulis paucis; semine uno subgloboso circiter 4 mm. diametro, testa crustacea nitida, embryo spirali habitu cochleato, cotyledonibus brevibus.

BRITISH NEW GUINEA: Central Division, Kubuna, *Brass 5642* (TYPE), December 1933, alt. 100 m., banks of stream in forest (small densely foliated tree).

The single-seeded fruit suggests that this species is perhaps related to *Myrtus acmenoides* F. v. Muell. and *M. monosperma* F. v. Muell. (not *M. nitida* Gmel. which, by Gaertner's plate, is a true *Syzygium*) of Australia. The species is readily distinguished from any other we have seen by the thin small narrowly lanceolate leaves with elongate obtuse but apiculate apices.

Named for Dr. A. L. Rand, the ornithologist of the Expedition.

***Myrtus Versteeghii* sp. nov.**

Arbor 12 m. alta; ramis fusciscentibus; ramulis novellis 4-angulatis apicem versus caesiis; foliis coriaceis glabris subinconspicue reticulatis suborbiculari-ovatis, 1.3–2.5 cm. longis 1–2 cm. latis, basi late cuneatis, apice brevissime acuminatis apiculatis, margine paullo recurvatis, supra olivaceo-brunnescentibus subtus pallidioribus, costa utrinque prominula, nervis primariis tenuibus utrinsecus 6–8 oblique adscendentibus prope marginem arcuatim confluentibus; petiolo  $\pm$  3 mm. longo; floribus subterminalibus atque in axillis foliorum superiorum dispositis, solitariis, pedunculis 1–1.5 cm. longis inconspicue pubescentibus, bracteis late linearibus calycis tubum subaequantibus; calyce dense adpresse albo-pubescente, tubo circiter 2 mm. longo, lobis 5 circiter 2 mm. longis rotundatis; petalis 5 subrotundatis 5 mm. longis, consperse glandulosis utrinque  $\pm$  pubescentibus; disco stamineo pubescente; filamentis filiformibus, antheris versatilibus rotundatis, connectivo haud producto angusto apice minute glanduloso; stylo subulato stamina vix superante basi pubescente; ovario biloculari; fructibus elongato-globosis vel ellipsoideis 1 cm. longis 0.8 cm. diametro calycis lobis coronatis.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass & Versteegh 10450*, *Brass 10618* (TYPE), 10930, October 1938, alt. 2800 m., mossy forest, occasional in tall forest of slopes, common in more open parts of forest (substage or subsidiary tree 4–12 m. high, 20–24 cm. diameter; flowers white; young fruit black).

The fruits of these collections are either immature or abnormal and without well developed seeds. The habit of the species strongly suggests that of *Myrtus inophloia* Bail. f. & White as shown in Queensl. Dep. Agr. Bot. Bull. 19: 8, t. 3. 1917, but the bark is not loose and thready, although the very narrow wings on the new branchlets soon break away, the leaves are glabrous and a little less acuminate, and the petals are more or less pubescent on both sides rather than fringed. At the apex of the pedicels and at the point of attachment of the leaves or perhaps at the base of the axillary buds are long (0.5–1 mm.) black subulate glands or bracts.

**Myrtus Brassii** sp. nov.

Arbor usque 8 m. alta; ramulis dense crispule hirtellis dense foliatis; foliis coriaceis novellis pilosis mox glabratissimis maturis minute glandulosis glabris vel subtus ad basim praecipue costa consperse breviter pilosis, lanceolatis vel anguste ovatis, 8-14 mm. longis 4.5-6 mm. latis, basi obtusis vel rotundato-cuneatis, apice acutis vel acute acuminatis, costa supra impressa subtus distincta, nervis obscuris; petiolo 1-1.5 mm. longo hirtello; floribus axillaribus solitariis; pedunculis vix 2 mm. longis pubescentibus; calyce minute pubescente dense glanduloso, tubo 2 mm. longo campanulato, lobis 5 late obtuseque triangularibus circiter 1.5 mm. longis; petalis 5  $\pm$  rotundatis circiter 3 mm. diametro, glabris consperse glandulosis; staminibus brevibus  $\pm$  2.5 mm. longis numerosis pluriserialibus, filamentis in connectivum confluentibus vix infra antheras dilatatis dein in apicem liberum (0.4 mm.) glanduloso-mucronatum productis, connectivo extus consperse glanduloso; ovario 3-loculari; stylo subulato circiter 3 mm. longo; stigmate anguste capitato quam stylo vix latiore; fructibus globosis calycis lobis coronatis; seminibus crustaceo-osseis subreniformibus tessellato-rugosis.

BRITISH NEW GUINEA: Central Division, Wharton Range, Murray Pass, *Brass 4514* (TYPE), July 1933, alt. 2840 m., very plentiful in the forests (spreading virgate tree up to 8 m. tall; leaves dark and shining above, paler beneath; flowers white; fruits dull black, fleshy, depressed, up to 1 cm. diameter); Mount Tafa, *Brass 4853*, August 1933, alt. 2700 m., fringe of forest just below cleared summit (small tree about 3 m. high).

This species is superficially somewhat like *Myrtus nekouana* Guill. of New Caledonia, but the latter has obtuse leaves, appressed pubescence, longer pedicels, and less modified stamens, the connective being only very little produced beyond the anther-sacs.

**Myrtus Archboldiana** sp. nov.

Arbor usque 5 m. alta; ramis  $\pm$  atro-cinereis; ramulis dense subadpresse albo-villosulis; foliis tenuiter coriaceis novellis sericeis mox glabratissimis maturis glabris vel costa pilosis ovato-lanceolatis, 3-4.5 cm. longis 1-2 cm. latis, basi obtusis, apicem versus subabrupte caudato-acuminatis, acumine 1-1.5 cm. longo apice acutissimo, in sicco rubro-brunnescentibus subtus minutissime glandulosis, costa supra impressa subtus prominula, nervis primariis vix manifestis; petiolo  $\pm$  2 mm. longo albo-villosulo; floribus solitariis in axillis foliorum superiorum dispositis; pedunculis 5-8 mm. longis, adpresse breviter pilosis; calyce adpresse breviter piloso consperse glanduloso, tubo campanulato 2 mm. longo, lobis 5 circiter 1.5 mm. longis obtusis; petalis 5 subrotundatis circiter 5 mm. diametro glabris consperse glandulosis; staminibus brevibus numerosis pluriserialibus, filamentis in connectivum confluentibus vix infra antheras dilatatis dein in apicem liberum productis, connectivo extus consperse glanduloso; ovario 3-loculari, stylo  $\pm$  4 mm. longo basi pubescente; stigmate subgloboso vix quam stylo latiore; fructibus subglobosis immaturis.

BRITISH NEW GUINEA: Central Division, Mount Tafa, *Brass 4101* (TYPE) May-September 1933, alt. 2300 m., plentiful in mossy forest (virgate tree up to 5 m.; leaves yellowish green, nerves obscure and midrib impressed above; flowers white, later pink).

This species and *M. Brassii* have very similar flowers but they are amply distinct in their vegetative characters.

### *Xanthomyrtus* Diels

The specific lines in this genus may appear to be more clearly cut when more material has been collected. The key-character, 2-loculed and 3-loculed ovary, is without value as both may occur on the same plant.

*Xanthomyrtus fasciculata* Diels, Bot. Jahrb. **57**: 363. 1922; Nov. Guin. **14**: 85. 1924; van Steenis Bull. Jard. Bot. Buit. III. **13**: 230. 1934.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass & Versteegh 10499*, October 1938, alt. 2700 m., frequent in forest (tree 16 m. high, 29 cm. diameter; bark brown, scaly; young fruit brown). BRITISH NEW GUINEA: Central Division, Mt. Tafa, *Brass 4039*, May 1933, alt. 2300 m., common in mossy forest (slender tree 5 m. tall, with dark flaky bark; leaves shining, black dotted beneath; fruit dark purple-red); same locality, *Brass 4892*, August 1933, alt. 2400 m., plentiful in ridge crest forest (small twiggy tree up to 7 m.; pale smooth obscurely nerved leaves; numerous small black fruit).

These specimens agree with the description of *Xanthomyrtus fasciculata* Diels except that the leaves are a little smaller ( $2-3.5 \times 0.7-1.5$  cm., with acumen  $0.7-1$  cm. long) than in the type ( $3.5-4.5 \times 1.6-2.2$  cm., with acumen 1 cm. long), and the inflorescence is longer pedunculate (4-6 mm., in contrast to 1-1.5 mm. in the original); in the material at hand the latter seems to be a variable character; further it might be noted that Stapf described the pedicels in *Myrtus flavida* as " $1\frac{1}{2}-2$  lin. longi, vel subnulli."

*Xanthomyrtus rostrata* sp. nov.

Arbor; ramulis glabris minute pustulatis; foliis magnis tenuiter coriaceis petiolatis, petiolo 3-4 mm. longo, lamina 2.5-5.5 cm. longa 1.3-3 cm. lata, late elliptica basi obtusa, in laminis majoribus apice abrupte in acumen angustum (0.8-1.3 cm. longo) excurrente, in minoribus apice acutiuscula, margine paululo recurva subtus copiose minute atro-glandulosa, costa supra paululo elevata subtus distincta, nervis primariis oblique adscendentibus atque vena intramarginali inconspicuis; cymulis glabris plerumque binis axillaribus pedunculatis, pedunculo  $\pm 1$  cm. longo, bracteis caducis; calycis tubo 2 mm. longo, lobis triangularibus acutiusculis 1.5 mm. longis basi circiter 1.5 cm. latis, petalis (uno tantum marcido viso) unguiculatis probabiliter 2.5-3 mm. longis; staminibus  $\pm 25$ ; ovario 2-loculari.

NORTHEASTERN NEW GUINEA: Matap, *Clemens 11131* (TYPE), February 1940, alt. 1500-1800 m. (tree with diameter 14 inches breast high; flower faded, base and segments dull wine-purple).

Although the specimen is somewhat fragmentary, we are unable to match it with either material or descriptions. It is perhaps closest to *Xanthomyrtus polyclada* Diels, but the leaves are broadly elliptic, not lanceolate, and the entire specimen (including the new shoots) is glabrous.

*Xanthomyrtus Schlechteri* Diels, Bot. Jahrb. **57**: 364. 1922; van Steenis, Bull. Jard. Bot. Buitenz. III. **13**: 231. 1934.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass & Versteegh 10491*, October 1938, alt. 2680 m., frequent in forest of valleys, (tree 12 m. high, 25 cm. diameter; bark brown, fairly smooth; fruits yellow-green); 18 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 12504*, February 1939, alt. 2080 m., occasional in primary forest on slope of ridge (tree  $\pm 17$  m. high, 43 cm. diameter; bark brown, scaly; fruit green); 6 km. southwest of Bernhard Camp, Idenburg River,



occasional subsidiary tree on steep slopes ( $\pm$  15 m. high, 20 cm. diameter; flowers yellow).

The original description of this species, based on Schlechter's collection from the Finisterre Mountains, seems to fit the above cited specimens reasonably well. Previously known only from the type-material.

**Xanthomyrtus longicuspis** Diels, Bot. Jahrb. **57**: 364. 1922; Nov. Guin. **14**: 85. 1924; Lane-Poole, Rep. For. Res. Pápua 128. 1925; Lam, Nat. Tijdschr. Nederl.-Ind. **89**: 91, 138. 1929; van Steenis, Bull. Jard. Bot. Buitenz. III. **13**: 231. 1934.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, Brass 12971, February 1939, alt. 1300 m., subsidiary tree (15 m. high; leaves very convex; flowers yellow).

**Xanthomyrtus longicuspis** var. **fruticosa** Diels, Bot. Jahrb. **57**: 364. 1922; Nov. Guin. **14**: 85. 1924.

NORTHEASTERN NEW GUINEA: Morobe District, Samanzing, Clemens 9290, November 1938, alt. 1650 m. (a whip-like shrub branched near the base; flowers bright yellow; terminal leaves reddish).

Previously recorded from Netherlands New Guinea.

**Xanthomyrtus scolopacina** (Ridley) Diels, Bot. Jahrb. **57**: 365. 1922.

*Eugenia scolopacina* Ridl. Trans. Linn. Soc. Bot. II. **9**: 49. 1916.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernhard Camp, Idenburg River, Brass 12631, February 1939, alt. 2150 m., mossy forest, a common subsidiary tree and one of the chief components of stunted scrubs on an exposed summit (tree 2-12 m. high; leaves convex, fruit purple-black).

We have recorded our scanty material of *Xanthomyrtus longicuspis* var. *fruticosa* Diels and *X. scolopacina* (Ridl.) Diels with the hope that someone with access to some of the duplicates and authentic type-material will kindly point out the essential differences between them, if any. *Xanthomyrtus longicuspis* Diels appears to be readily distinguishable by the long caudate acumen of the leaf. This is not quite so long in var. *fruticosa* Diels, and furthermore the branchlets are very slender. In the specimen assigned to *X. scolopacina* (Ridl.) Diels, the branchlets are a little stouter than in *X. longicuspis* var. *fruticosa* Diels, but both have very short axillary inflorescences and the leaves are very much alike; in *X. scolopacina* (Ridl.) Diels, however, the leaves, although in part pointing forward, are predominantly reclinate, a character emphasized by Diels in the description of *X. Pullei* Diels. Further material to show variation, in addition to access to the types, would be most helpful in any attempt clearly to define the species and variety here involved.

**Xanthomyrtus lanceolata** sp. nov.

Arbor 14 m. alta; ramulis novellis albo-villosis, vetustis cinereis glabratiss; foliis novellis parce albo-villosis interdum cito glabratiss vel demum glabratiss petiolatis, petiolo 2-3 mm. longo  $\pm$  villosulo vel glabrato, lamina coriacea 2.5-5.5 cm. longa 0.7-1.7 cm. lata, basi obtusa vel rotundato-cuneata apice anguste acuminata, acumine 0.7-1.5 cm. longo, margine non curvata, utrinque glabrata vel subtus consperse villosula, costa utrinque prominula, nervis primariis atque vena intramarginali inconspicuis; floribus non visis; baccis parce pubescentibus solitariis axillaribus  $\pm$  3.5 mm. diametro, calycis lobis (1.5 mm. longis vix 1.5 mm. latis) coronatis, breviter pedunculatis vel subsessilibus.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh 11109* (TYPE), November 1938, alt. 2250 m., occasional in primary forest (tree 14 m. high, 32 cm. diameter; bark scaly, slightly fissured; fruits greenish brown).

In the size, shape and indument of the leaves, this species suggests *Xanthomyrtus polyclada* Diels, although in the latter the leaves are described as chartaceous. In our species the leaves are coriaceous and it seems worth mentioning that this is the only species we have seen in which the glands of the leaves are obscure; the fruit, nevertheless, is surely that of *Xanthomyrtus*. The almost sessile single fruits might indicate that this species is related to *X. longicuspis* Diels. Flowering material is needed to clarify its position in the genus.

***Xanthomyrtus flavida*** (Stapf) Diels; Merr. Sarawak Mus. Jour. **3**: 533. 1928; van Steenis Bull. Jard. Bot. Buitenz. III. **13**: 230. 1934.

*Myrtus flavida* Stapf in Hook. Ic. **23**: t. 2290. 1894; Trans. Linn. Soc. Bot. II. **4**: 151. 1894.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, *Brass 4036*, May 1933, alt. 2300 m., common in mossy forest (erect tree 12–15 m. tall; leaves aromatic, upper side glossy, punctate and paler beneath; old leaves red; calyx purple).

This collection compares favorably with the larger-leaved specimens of *Xanthomyrtus flavida* (Stapf) Diels from Borneo. The younger branchlets, petioles, and midrib on the lower surface of the leaves are short-villous, the leaf-blade tends to be more concave and the margins more recurved than in the Bornean species, and the glands on the lower surface are a little larger and more irregularly placed in the New Guinea material. The fruits have 26–30 stamens still clinging to them and about the same number of seeds as in the Bornean collections. At present we cannot see sufficient differences to separate *Brass 4036* from the Bornean species.

***Xanthomyrtus cardiophylla*** sp. nov.

Frutex 1.5 m. altus epiphyticus; ramulis minute pustulatis apice tantum albido-pubescentibus; foliis coriaceis magnis breviter petiolatis, petiolo 1–1.7 mm. longo atrofusco, lamina cordato-ovata, 3.7–7 cm. longa, 2–4.2 cm. lata, apice acutiuscula vel  $\pm$  abrupte breviter obtuseque acuminata, acumine 0.5–0.8 cm. longo, margine leviter recurva, glabra supra punctulata subtus minute glandulosa, costa utrinque prominula, venis primariis manifestis oblique patentibus, venis intramarginalibus duplicibus prominulis cujus exteriore superne evanescente; cymulis singulis vel binis axillaribus terminalibusque interdum in internodio dispositis pedunculatis, pedunculo 1–2 cm. longo parce adpresse piloso leviter pustulato; bracteis basi tubi calycini ellipticis vel ovatis  $\pm$  3 mm. longis 2 mm. latis (in cyma una usque 1 cm. longis 0.7 cm. latis); calycis tubo parce pilosulo vel glabro 2–2.5 mm. longo, lobis triangularibus 1–1.5 mm. longis basi 1.5 mm. latis; petalis breviter unguiculatis 2 mm. longis 1.5 mm. latis; staminibus  $\pm$  25, filamentis circiter 2 mm. longis; ovario 2-loculari; baccis  $\pm$  8 mm. diametro.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13452* (TYPE), March 1939, alt. 850 m., rain-forest (stiff shrub 1.5 m. tall, epiphytic on a tall tree; flowers yellow; fruit soft, black).

This is the only species we have noted with distinctly cordate and prac-

tically sessile leaves. The venation too is rather striking; toward the base of the leaf the two intramarginal nerves are almost as prominent as the midrib, and sometimes there is a third outside of these very close to the margin and very faint, but only the inmost one continues to the apex while the other gradually approaches the margin and fades near the middle of the leaf; the primary veins are easily seen but are not so prominent as the midrib and the intramarginal ones.

Diels has described one species as epiphytic (?). Its broadly ovate leaves are 1–1.5 cm. long and 0.5–1 cm. wide. He does not mention the shape of the base of the leaf, but the flower is somewhat smaller than in our specimens and has only about half the number of stamens; although the latter is a variable character, without authentic material for comparison we could not possibly fit our plant with the description of *Xanthomyrtus bryophila* Diels.

***Xanthomyrtus cardiophylla* var. *parvifolia* var. nov.**

A forma typica differt foliis 1.8–4 cm. longis 0.9–2.4 cm. latis, cymulis 1-floris, pedunculis usque 1 cm. longis.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass 12057* (TYPE of var.), January 1939, alt. 1800 m., mossy forest, abundant as an epiphyte on high trees (slender shrub 1–1.5 m. high; flowers yellow; fruit black, fleshy).

***Xanthomyrtus humilis* sp. nov.**

Frutex humilis 1 m. altus; ramulis leviter pustulatis novellis adpresse pubescentibus; foliis interdum reclinatis coriaceis petiolatis, petiolo 1–1.5 mm. longo primo pubescente demum glabrato, lamina 1–1.7 cm. longa, 0.5–1 cm. lata, ovata vel elliptico-ovata apice abrupte breviter ac obtuse acuminata, acumine 2–3 mm. longo, basi obtusa vel rotundata, margine recurva vel interdum revoluta novella utrinque pilosula vetusta supra glabra punctata subtus praecipue costa  $\pm$  pilosula glandulosa, costa supra impressa subtus prominenti, nervis primariis in lamina novella  $\pm$  prominulis invetusta inconspicuis; inflorescentiis axillaribus terminalibusque interdum in internodio locatis; floribus in dichasiis simplicibus (cymis ultimis 1–3-floris) dispositis, dischasiis ramis basi bracteatis, vel floribus solitariis; pedunculo usque 3 mm. longo pubescente; bracteis basi floris linearibus pubescentibus quam calycis tubo brevioribus; calycis tubo parce pubescente 2 mm. longo, lobis anguste triangularibus 1.5–2 mm. longis 1 mm. latis extus glabris vel consperse pilosulis; petalis vix 3 mm. longis breviter unguiculatis; staminibus  $\pm$  20, filamentis circiter 4 mm. longis; ovario 2-loculari; placentis circiter 12-ovulatis; baccis  $\pm$  5 mm. diametro.

NETHERLANDS NEW GUINEA: Balim River, *Brass 11784* (TYPE), December 1938, alt. 1700 m., abundant on stony grassless hillsides (low spreading, sometimes scrambling shrub 1 m. high; flowers yellow; fruit black, fleshy).

Perhaps this species is related to *Xanthomyrtus Pullei* Diels. The flowers of *X. humilis* Merr. & Perry are larger, the leaves are broader, and only a part of them are reclinate, the others being spreading or ascending. In size and outline, the leaves correspond very well to the description of those of *X. bryophila* Diels, but this has a much smaller flower than our species. This is the only species of the genus we have seen with a branching inflorescence.

***Xanthomyrtus papuana* sp. nov.**

Arbor 12–20 m. alta; ramulis numerosis  $\pm$  pilosis atque dense verruculosus; foliis petiolatis, petiolo 2–3 mm. longo glabro vel piloso, lamina tenuiter coriacea 1.1–1.6(–2) cm. longa 0.7–0.9(–1.2) cm. lata elliptica basi cuneata apice obtusa margine valde recurva interdum revoluta, novella villosula cito glabrata, vetusta glabra vel subtus costa praecipue interdum basim versus laminae consperse pilosa, supra olivacea subnitida subtus brunnescens dense minuteque glandulosa, costa utrinque prominula, nervis primariis inconspicuis subtus interdum manifestis; cymulis 1–3-floris axillaribus terminalibusque pedunculatis, pedunculo 4–10 mm. longo  $\pm$  villosulo, bracteae basi calycis tubi linearibus  $\pm$  pilosis; calycis tubo 2 mm. longo villosulo, lobis extus glabris anguste triangularibus 2 mm. longis basi 1 mm. latis; petalis 3 mm. longis 1.5 mm. latis unguiculatis; staminibus 20–25, filamentis  $\pm$  5 mm. longis; ovario 2–3-loculari; baccis late globosis circiter 5 mm. diametro, calycis lobis coronatis.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass* 10584, October 1938, alt. 2800 m., common in forest substage (tree 18–20 m. high; leaves convex and margins recurved; flowers yellow); same locality, *Brass* 10652 (TYPE, fls.), 10653 (fr.), October 1938, alt. 2900 m., mossy forest of ridges (slender substage tree to  $\pm$  12 m. high; leaves convex, the margins much recurved; flowers yellow).

From the descriptions of the Papuan species of *Xanthomyrtus*, we believe *X. papuana* to be more like the Philippine *X. diplycosifolia* (C. B. Rob.) Merr. (including *X. aurea* (Elm.) Merr., which we are now inclined to believe cannot be maintained as a distinct species) than any of the Papuan ones. It differs in the revolute character of the leaves, the more pubescent inflorescences, and the longer narrower calyx-lobes.

Two collections from Northeastern New Guinea probably belong here, but we cannot be sure of the determination of almost sterile material: Sarawaket, *Clemens* 5588, 5755, March and April 1937, leaves and a single detached fruit.

***Xanthomyrtus papuana* var. *parviflora* var. nov.**

A forma typica differt partibus novellis parce pubescentibus, floribus paululo minoribus, calycis tubo 1.5 mm. longo, lobis 1.5 mm. longis, staminibus 15–25; foliis 0.8–1.7 cm. longis, 0.3–0.9 cm. latis.

BRITISH NEW GUINEA: Central Division, Wharton Range, Murray Pass, *Brass* 4521, 4573 (TYPE of var.), 4629, July 1933, alt. 2840 m., common in forests (compact dense foliated tree up to 7–8 m. with flaky brown bark, profuse bright yellow flowers, smooth shining purple fruit. Fruit of 4521: black, soft, 5 mm. diameter).

In this material from Murray Pass, on both the new growth and the inflorescence, the trichomes are shorter and more sparse than in the collections from Lake Habbema region; the flowers and also the leaves are a little smaller. It does not seem, however, from the specimens at hand, that more than one species is represented.

***Xanthomyrtus Dielsiana* sp. nov.**

Frutex vel arbor parva; ramulis numerosis verruculosus novellis albobubescentibus; foliis parvis confertis coriaceis petiolatis, petiolo 1–1.5 mm. longo, lamina 4–6(–9) mm. longa 2.5–4 mm. lata anguste ovata vel lanceolato-elliptica, apice obtusa basi rotundata vel obtusa, margine revoluta interdum tantum valde recurva, novella apicem versus ramulorum



pilosula mox glabrata, supra interdum punctulata subtus glandulosa, costa supra impressa subtus  $\pm$  inconspicua, nervis primariis obscuris; cymulis trifloris vel floribus solitariis in axillis foliorum superiorum dispositis interdum subterminalibus basi bibracteolatis, bracteolis lineari-oblongis pilosulis calycis tubo subaequilongis vel brevioribus; calycis tubo extus pilosulo intus conperse pilosulo 2–2.5 mm. longo, lobis anguste triangularibus 2–2.5 mm. longis basi 1–1.5 mm. latis; petalis luteis conspicue unguiculatis  $\pm$  4 mm. longis 3 mm. latis; staminibus  $\pm$  27, filamentis circiter 5 mm. longis, antheris parvis; ovario 2-(interdum 3-) loculari; placentis circiter 12-ovulatis; baccis  $\pm$  5 mm. diametro.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass* 9018, 9269 (TYPE), 9462, August 1938, alt. 3225 m., the principal tree or shrub on drier peaty ridges (2–3 m. high; branches upright; flowers yellow); 7 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9625, 9904, September 1938, alt. 3560 m., subalpine forest (tree 5–10 m. high; bark when not covered with moss peeling in brittle brown flakes; corolla, anthers and stigma dark yellow; fruit blackish blue); 11 km. northeast of Wilhelmina-top, *Brass & Myer-Drees* 9641, September 1938, alt. 3400 m., subalpine forest (6 m. high; fruit dark blue); 2 km. east of Wilhelmina-top, *Brass & Myer-Drees* 10125, September 1938, alt. 3800 m., common on creviced faces of sandstone (dwarfed tree 1–2 m. high; leaves convex; flowers yellow; fruit black, fleshy); same locality, *Brass & Myer-Drees* 10377, September 1938, alt. 3700 m., edge of subalpine forest (shrub with leaves somewhat whitish beneath; ripe fruit dark blue); 6 km. northeast of Lake Habbema, *Brass* 10665, October 1938, alt. 3000 m., shrubberies on a peaty depression in forest (subprostrate shrub; flowers yellow).

In the dried specimens this species has a distinct habit. In all but three numbers (10125, 10377, 10665) the leaves are so strongly revolute that only a narrow strip of the lower surface is visible, and the upper part of the branchlets appears greyish or whitish, owing to the very fine pubescence on both leaves and branchlets. This pubescence at length disappears, as it is not present on the older parts, yet it can hardly be considered to be quickly evanescent, as it occurs on some branchlets bearing fruits. In nos. 10125 and 10377, the leaves are somewhat revolute or have strongly recurved margins, superficially suggesting *Xanthomyrtus arjakensis* (Gibbs) Diels, as represented by *Kanehira* 13565 from the Angi Lakes. The flowers of the latter, however, are readily distinguished from those of our species by the shorter and more rounded calyx-lobes and also by the glabrous character. Among the species described by Diels, *X. Dielsiana* seems to share in some of the characters of both *X. linnaeifolia* and *X. calytrichoides*. The flowers of *X. linnaeifolia* Diels are smaller than those of our species. The latter differs from *X. calytrichoides* Diels in the constantly pubescent tips of the branchlets, the somewhat narrower leaves with revolute rather than recurved margins, and the occurrence of the inflorescences only occasionally at the apex of the branchlets although always to be found on the upper part. The flowers occur both singly and in cymes, sessile in the axils of the leaves or on peduncles up to 5 mm. long.

**Xanthomyrtus Klossii** (Ridl.) Diels, Bot. Jahrb. **57**: 366. 1922; Nov. Guin. **14**: 86. 1924; Lam, Nat. Tijdschr. Nederl.-Ind. **89**: 72. 1929; van Steenis, Bull. Jard. Bot. Buitenz. III. **13**: 230. 1934.

NETHERLANDS NEW GUINEA: 9 km. northeast of Lake Habbema, *Brass* 10521, October 1938, alt. 2850 m., mossy forest, common on crests of ridges (tree 5–7 m.

high; branches horizontal; flowers yellow); same locality, *Brass* 10523 (immature fruit); same locality, *Brass* 11001, October 1938, alt. 2900 m., very abundant in open stunted mossy forest of crests (shrub or low flat tree 1-3 m. high).

These specimens agree reasonably well with Diels' somewhat amplified description of this species. In *Brass* 10521 the leaves are a little larger (6-14 mm.  $\times$  4-6 mm.) than either Diels or Ridley describe them, but the specimen is surely conspecific with the others cited here. Ridley indicates no variation at all in the leaf-size (5 mm.  $\times$  3 mm.).

**Xanthomyrtus Klossii** (Ridl.) Diels var. **brevipedunculata** Diels, Nov. Guin. 14: 86, 1924; Lam, Nat. Tijdschr. Nederl.-Ind. 89: 72, 87, 101, 132, 134, 135, 1929.

NETHERLANDS NEW GUINEA: Lake Habbema, *Brass* 9074, August 1938, alt. 3225 m., prostrate on mossy or lichen-covered ground, also on open boggy grassland (flowers yellow; fruit black, fleshy); 6 km. northeast of Lake Habbema, *Brass* 10664, October 1938, alt. 3000 m., prostrate on an open peaty depression in forest.

The tips of the younger branchlets and sometimes the petioles are sparsely pilose. On the same specimen there are flowers with both 2- and 3-loculed ovaries.

**Xanthomyrtus exigua** sp. nov.

Arbor parva 1.5-5 m. alta; ramis ultimis tenuiter ramulosis, ramulis numerosis  $\pm$  villosulis; foliis prima juventute albido-villosis cito glabris demum glabris, coriaceis, in sicco supra atrofusis vel olivaceis subtus brunnescentibus petiolatis, petiolo circiter 1 mm. longo  $\pm$  villosulo, lamina  $\pm$  deorsum reclinata ovata vel lanceolato-elliptica, 3-7 mm. longa, 2-4 mm. lata, basi rotundata apice obtusa margine non recurva supra leviter punctulata subtus glandulosa, costa supra leviter impressa subtus manifesta, nervis primariis atque venis inconspicuis; floribus parvis axillaribus terminalibusque breviter pedunculatis, pedunculo 1-2 mm. longo villosulo; bracteis linearibus obtusis calycis tubum paululo superantibus; calyce  $\pm$  villosulo, tubo 1 mm. longo, lobis triangularibus acutiusculis vix 1 mm. longis basi totidem latis; petalis vix 2.5 mm. longis 1.5 mm. latis unguiculatis; staminibus  $\pm$  10, filamentis 1.5-2 mm. longis; ovario 2-loculari.

NETHERLANDS NEW GUINEA: 18 km. southwest of Bernard Camp, Idenburg River, *Brass* 12452 (TYPE), February 1939, alt. 2150 m., mossy forest, common as a substage tree in open forest and one of the chief components of low scrubs on an exposed summit (1.5-5 m. high; young leaves very pale pubescent; flowers yellow).

Among the *Xanthomyrtus* species described by Diels this seems to be close to *X. linnacifolia*. The latter has pustulate branchlets, a character which, if present in *X. exigua*, is concealed by the pubescence of both younger and older branchlets. The pubescence on the leaves is more evanescent and may entirely disappear, leaving the leaf glabrous or in the intermediate stage conspersely pilose with a barbate apex. The leaf-margin is not at all recurved. The small pubescent flowers are inconspicuous but mostly single and axillary toward the upper part of the branchlets.

### **Eugenia** Linnaeus

We have found only one species of *Eugenia sensu strictu* in the collection. As yet, we are not quite sure of the status of *Jossinia* Comm. and whether or not it is separable from *Eugenia* Linn. When working on the Bornean material, we borrowed a number of specimens from the Kew Herbarium in

the hope of settling the question in our own minds, but much more ample material is needed to make the decision. Diels has pointed out that *Tourinia* is much more like the American *Eugenia* than either *Jambora* or *Syzygium*, but unfortunately does not specify how they differ. There are, in the collections of New Guinean material available, only two species which belong to *Tourinia* in the strict sense of the term; these we are omitting for the present.

*Eugenia Brassii* sp. nov.

Arbuscula 1.5-4 m. alta; ramulis teretibus cinerascentibus novellis compressis brunnescentibus, foliis chartaceis vel tenuiter coriaceis in sicco supra olivaceis subtus pallidioribus minutissime atro-glandulosis, oblongis vel subovatis vel oblongo-ellipticis, 4-12.5 cm. longis, 1.5-4(-6) cm. latis, basi obtusis vel rotundato-cuneatis apicem versus angustatis apice obtusiusculis margine vix recurvatis, costa supra plana vel leviter canaliculata subtus prominula, nervis primariis simplicibus utrinque exigue manifestis irregularibus in venam intramarginalem 1.5-3 mm. a margine confluentibus; petiolo circiter 5 mm. longo, inflorescentiis racemoso-cymosis usque 5-floris axillaribus saepius fasciculatis, pedunculo brevissimo  $\pm$  3 mm. longo, rhachi usque 7 mm. longa, pedicellis  $\pm$  3 mm. longis; alabastris circiter 5 mm. longis, apice 3 mm. diametro, parte infera clavata vel anguste subcampanulata supera subglobosa; calycis lobis 4 rotundatis exterioribus 1.5-2 mm. longis quam interioribus paulo minoribus; petalis 4 late oblongis singulatum deciduis; staminibus numerosis  $\pm$  3 mm. longis, antheris vix 1 mm. longis oblongis; stylo circiter 4 mm. longo, stigmatibus peltatis; fructibus oblongis  $\pm$  1.5 cm. longis, 1 cm. diametro, apice vix umbilicatis, calycis lobis deciduis.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass* 7474, August 1936, occasional in rain-forest undergrowth (tree 3-4 m. high; fruit black, fleshy, solitary or paired in axils); Tarara, Wassi Kussa River, *Brass* 8429 (TYPE), December 1936, undergrowth in light rain-forest (weak near-tree 1.5-2 m. high; leaf-nerves obscure; flowers white).

In the fruit the cogledons are grown so closely together as to appear as one. At first glance the flowering material might be taken for *Syzygium* Gaertn. On closer examination, however, a single inflorescence is never more than a short raceme. The stigmas are definitely peltate; in *Syzygium* they are punctiform.

*Acmena* De Candolle

*Acmena acuminatissima* (Blume) Merr. & Perry, Jour. Arnold Arb. 19: 12, 1938.

*Myrtus acuminatissima* Blume Bijdr. 1088, 1826.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh* 11142, November 1938, alt. 2400 m., common in primary forest (tree 31 m. high, 52 cm. diameter; bark black, scaly; young fruit rose).

The brittleness and the general aspect of this collection is very similar to that of some Philippine collections of *Acmena acuminatissima* (Bl.) Merr. & Perry. This material seems to have no characters by which we might separate it from this species ranging from China to the Solomon Islands.

*Acmena polyantha* (Lauterb. & K. Schum.) Merr. & Perry, Jour. Arnold Arb. 19: 11, 1938.

*Xenodendron polyanthum* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 461, t. 16, 1900; Diels, Bot. Jahrb. 57: 415, 1922.



BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 7977, rain-forest, common on ridges (substage tree; flowers white, produced in great abundance). NORTHEASTERN NEW GUINEA: Sattelberg, *Clemens* 1086, 1750, alt. 900 m.

The leaves in the Fly River collection are a little larger than those of plants from the higher altitudes, and some of them are less acuminate, but this is probably only a variation within the species.

***Acmena laevifolia*** (Ridl.) Merr. & Perry, Jour. Arnold Arb. **19**: 18. 1938, vel aff.  
*Eugenia laevifolia* Ridl. Trans. Linn. Soc. Bot. II. **9**: 48. 1916.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh* 11131, November 1938, alt. 2400 m., rare in primary forest (tree 20 m. high, 43 cm. diameter; bark fairly smooth, black; flowers white).

This collection differs from Ridley's description chiefly in having smaller leaves (about 7 cm. long and 2.5 cm. wide) with rounded-cuneate base. Possibly it is a distinct species, but the specific lines in the genus are difficult to define, hence it seems best to wait for more material to accumulate.

***Acmena hemilampra*** (F. v. Muell. ex F. M. Bail.) Merr. & Perry, Jour. Arnold Arb. **19**: 15. 1938.

*Eugenia hemilampra* F. v. Muell. ex F. M. Bail. Synop. Queensl. Fl. Suppl. **1**: 23. 1886.

BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass* 7766, September 1936, rain-forest (canopy-tree attaining 30 m.; soft suberose scaly brown bark; flowers white), 7941, common in light fringing rain-forests (tree 14–15 m. high; flowers white); Gaima, Lower Fly River, *Brass* 8283, common in rain-forests (profusely flowering canopy-tree; bark brown, thick, hard, deeply fissured, red when cut; flowers and fruit white).

These collections scarcely differ from the Australian material of this species except that the leaves are obtuse, hardly any of them showing the obtuse acumination found in most (but not all) Australian collections; the new branchlets are sulcate but quickly become terete.

### ***Syzygium* Gaertner**

Although the material here considered under *Syzygium* Gaertn. is highly diverse, we have found no basis for changing the concept of the genus as presented in our study of the Bornean species of *Syzygium*. The other genera we have accepted conventionally. *Syzygium* is the largest one represented in New Guinea, and, knowing the general practices, on the one hand to divide the material into *Jambosa* DC. and *Syzygium* Gaertn., and on the other to mass all under *Eugenia* Linn., we have again reconsidered our position. It had been suggested to us that the fruits of *Jambosa* DC. are soft and fleshy, whereas those of *Syzygium* Gaertn. are hard even when ripe. We have tried to break our collection on that basis, only to find a collection from the Solomon Islands with flowers of *Jambosa* but with the pericarp of the dried fruit so full of fibres that we had to cut it with a saw in order to examine the structure of the seed. Many fleshy fruits are crowned by very short calyx-lobes and very narrow staminal disks. Furthermore, in a half grown condition it would not be easy to distinguish fleshy from firm fruits without some supporting characters. We have not space to enumerate all the interesting variations we have seen for the first



time in this material, but in spite of these we have failed to locate any really fundamental differences which might form the basis of generic distinction for *Jambosa* and *Syzygium*. We have found only two Malaysian species in the collection.

In order to make our list of names reasonably complete for reference, we merely note that in addition to the species represented or mentioned in comments in our paper, we have no additional material of ***Syzygium hylochare*** (Diels) comb. nov. (*Jambosa hylocharis* Diels, Jour. Arnold Arb. **10**: 83. 1929); ***Syzygium najadum*** (Diels) comb. nov. (*Jambosa najadum* Diels, op. cit. 82); ***Syzygium Sargentianum*** (Diels) comb. nov. (*Jambosa Sargentiana* Diels op. cit. 83); ***Syzygium lagynocalyx*** (Diels) comb. nov. (*Jambosa lagynocalyx* Diels, Bot. Jahrb. **57**: 394. 1922); ***Syzygium trachyanthum*** (Diels) comb. nov. (*Jambosa trachyantha* Diels, op. cit. 394). We have small photographs of ***Syzygium garcinoides*** (Ridl.) comb. nov. (*Eugenia garcinoides* Ridl. Trans. Linn. Soc. Bot. II. **9**: 44. 1916); ***Syzygium monetarium*** (Ridl.) comb. nov. (*Eugenia monetaria* Ridl. op. cit. 49); ***Syzygium subalatum*** (Ridl.) comb. nov. (*Eugenia subalata* Ridl. op. cit. 44); ***Syzygium Vandewateri*** (Ridl.) comb. nov. (*Eugenia Vandewateri* Ridl. op. cit. 45); ***Syzygium Wollastonii*** (Ridl.) comb. nov. (*Eugenia Wollastonii* Ridl. op. cit. 47). The following species are not mentioned elsewhere in the article, nor are they represented in our herbarium: ***Syzygium cladopterum*** (Diels) comb. nov. (*Jambosa cladoptera* Diels, Bot. Jahrb. **57**: 391. 1922); ***Syzygium decoriflorum*** (Diels) comb. nov. (*Jambosa decoriflora* Diels op. cit. 396); ***Syzygium pachyanthum*** (Diels) comb. nov. (*Jambosa pachyantha* Diels, op. cit. 395); ***Syzygium phacelanthum*** (Diels) comb. nov. (*Jambosa phacelantha* Diels, op. cit. 390); ***Syzygium polyphlebium*** (Diels) comb. nov. (*Jambosa polyphlebia* Diels, op. cit. 391); ***Syzygium riparium*** (Diels) comb. nov. (*Jambosa riparia* Diels, op. cit. 389); ***Syzygium verniciflorum*** (Diels) comb. nov. (*Jambosa verniciflora* Diels, op. cit. 387); ***Syzygium xylopiaceum*** (Diels) comb. nov. (*Jambosa xylopiacea* Diels, op. cit. 392); ***Syzygium aeoranthum*** (Diels) comb. nov. (*Jambosa aeorantha* Diels, Nov. Guin. **14**: 90. 1924); ***Syzygium Bruynii*** (Diels) comb. nov. (*Jambosa Bruynii* Diels, op. cit. 92); ***Syzygium Thomseni*** (Diels) comb. nov. (*Jambosa Thomseni* Diels, op. cit. 91); ***Syzygium Rechingeri*** nom. nov. (*Jambosa micrantha* Rech. Rep. Sp. Nov. **11**: 183. 1912, non *S. micranthum* Bl.); ***Syzygium sabangense*** (Lauterb.) comb. nov. (*Jambosa sabangensis* Lauterb. Nov. Guin. **8**: 320. 1910); ***Syzygium dolichophyllum*** (Lauterb. & K. Schum.) comb. nov. (*Jambosa dolichophylla* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 471. 1900); ***Syzygium synaptoneurum*** (Lauterb. & K. Schum.) comb. nov. (*Jambosa synaptoneura* Lauterb. & K. Schum. in K. Schum. & Lauterb. op. cit. 475); ***Syzygium bibracteatum*** (Greves) comb. nov. (*Eugenia bibracteata* Greves, Jour. Bot. **61**: suppl. 18. 1923); ***Syzygium duplomarginatum*** (Greves) comb. nov. (*Eugenia duplomarginata* Greves, op. cit. 15); ***Syzygium merokense***

(Greves) comb. nov. (*Eugenia merokensis* Greves, op. cit. 16); **Syzygium niviferum** (Greves) comb. nov. (*Eugenia nivifera* Greves, op. cit. 19); **Syzygium pergamaceum** (Greves) comb. nov. (*Eugenia pergamacea* Greves, op. cit. 16); **Syzygium porphyrocarpum** (Greves) comb. nov. (*Eugenia porphyrocarpa* Greves, op. cit. 17); **Syzygium salpinganthum** (Greves) comb. nov. (*Eugenia salpingantha* Greves, op. cit. 19); **Syzygium sogerense** (Greves) comb. nov. (*Eugenia sogerensis* Greves, op. cit. 18); **Syzygium trichotomum** (Greves) comb. nov. (*Eugenia trichotoma* Greves, op. cit. 19); **Syzygium Warburgii** nom. nov. (*Eugenia glomerata* Warb. Bot. Jahrb. **13**: 390. 1891, non Lam. 1791); **Syzygium Bartonii** (F. M. Bail.) comb. nov. (*Eugenia Bartonii* F. M. Bail. Proc. Roy. Soc. Queensl. **18**: 2. 1903); **Syzygium LeHuntei** (F. M. Bail.) comb. nov. (*Eugenia LeHuntei* F. M. Bail. Queensl. Agric. Jour. **9**: 411. 1901). The last species may possibly be an *Acmena* but very few *Acmena* species have the leaves copiously glandular. We cannot be sure whether the two species, *Eugenia koikokoensis* Greves and *E. racemoides* Greves, belong to *Eugenia* or to *Syzygium*, nor are we willing to pass upon *Eugenia coalita* Greves without first examining the type. We suspect, however, that it is a *Syzygium*. *Syzygium ellipticum* Lauterb. & K. Schum. Fl. Deutsch. Schutzg. Südsee 476. 1900, type from New Guinea, which Diels, Bot. Jahrb. **57**: 367. 1922, indicates is a *Psidium*, is, from the description, nothing but the common pan-tropic guava, *Psidium guajava* Linn., and should be placed with the synonymy of the latter.

We have so many species represented that it has seemed to us they might be more easily located if they were broken up into a few groups by some superficial characters; hence, a very brief key is interspersed between groups of species which have some one character in common; we have not tried to group them together in any natural system; much more material would have to be examined before that could be done with any degree of confidence.

*A. Bracts of the inflorescence subcoriaceous, apparently persistent.*

**Syzygium anomalum** Lauterb. Nov. Guin. **8**: 853. 1912; Diels, Bot. Jahrb. **57**: 405. 1922.

NETHERLANDS NEW GUINEA: Hollandia, Brass 9001, July 1938, alt. 100 m., occasional in rain-forest substage (flowers small white; fruit red, about 8–10 mm. diameter); *Neth. Ind. For. Service* bb.25052, July 1938, alt. 50 m.

These collections are from the type-locality, but it seems worth while to record the color and size of the fruit as found in the field notes.

**Syzygium bracteosum** sp. nov.

Arbor usque 29 m. alta; ramis atro-cinereis; ramulis teretibus vel subcompressis brunnescentibus; foliis valde coriaceis in sicco brunneis vel olivaceo-viridibus supra consperse punctatis subtus manifeste reticulatis, ellipticis vel obovato-ellipticis, 4–10 cm. longis, 2.5–5.5 cm. latis, basi acutis vel cuneatis, apice obtuse acuminato recurvato, margine  $\pm$  recurvatis, costa supra impressa subtus elevata, nervis primariis utrinsecus  $\pm$  10 supra indistinctis vel leviter aciculatis subtus prominulis subirregulariter dispositis 7–9 arcubus intramarginalibus a margine 3–4 mm. remotis conjunctis; petiolo 6–9 mm. longo supra canaliculato; inflorescentiis ter-

minalibus subcorymbosis  $\pm$  4 cm. longis 6 cm. latis compacte multifloris, a basi ramosis bracteolatis, bracteolis persistentibus concavis subrotundatis circiter 2 mm. longis, alabastris immaturis obconicis 5 mm. longis 4 mm. diametro, calycis lobis exterioribus 1.5 mm. longis.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass & Versteegh 11117*, November 1938, alt. 2300 m., rare tree of primary forest (24 cm. high, 31 cm. diameter; bark 5 mm. thick, white, scaly; flower buds red); 15 km. northeast of Lake Habbema, *Brass & Versteegh 11986* (TYPE), January 1939, alt. 1800 m., rare in primary forest (tree 29 m. high, 107 cm. diameter; bark 11 mm. thick, black-brown, scaly; flower-buds rose).

These collections, though not exactly in the same stage of development, appear to represent a single species perhaps allied to *Syzygium dictyoneurum* Diels or *S. Caroli* Diels, both of which are described as having chartaceous leaves. The collections here cited have strongly coriaceous leaves fairly smooth above but with obvious primary nerves and reticulations on the lower surface.

***Syzygium pallens* sp. nov.**

Arbor gracilis 4 m. alta; ramis teretibus; ramulis compressis fulvescentibus; foliis chartaceis in sicco supra olivaceo-viridibus subtus pallidioribus conperse minute atro-glandulosi oblongo-lanceolatis, 4.5–12.5 cm. longis, 1.4–3.5 cm. latis, utrinque angustatis basi acutis paulo decurrentibus, apice acuminatis, acumine  $\pm$  1 cm. longo, costa supra impressa subtus prominula, nervis primariis numerosis oblique patentibus interdum fere subobscuris; petiolo  $\pm$  1 cm. longo tenui supra canaliculato; paniculis terminalibus 1.5–2 cm. longis paucifloris (usque 12), rhachi atque ramis saepe rimulosis, ramis apice bibracteatis, bracteis concavis ovatis obtusis 1–1.5 mm. longis subpersistentibus; floribus parvis sessilibus plerumque apice ramorum solitariis; calycis tubo campanulato 2–3 mm. longo latoque, lobis 4 circiter 1 mm. longis; staminibus 3–4 mm. longis, filamentis basi annulato-connatis; fructibus non visis.

BRITISH NEW GUINEA: Central Division, Ononge Road, Dieni, *Brass 3936* (TYPE), May 1933, alt. 500 m., rain-forest (very slender tree 4 m. tall; dark smooth flat leaves, paler beneath; calyx red, petals and stamens white).

The species approaches the description of *Syzygium gyrostemoneum* Diels. Without authentic material for comparison we cannot say whether the two are identical or not. It is to be noted, however, that the collection before us is smaller in both foliage and flowers, the leaves are not cuspidate, and the venation is less obvious than that described by Diels.

***Syzygium papuasicum* sp. nov.**

Arbor usque 30 m. alta; ramis teretibus cortice rimosis; ramulis teretibus novellis sulcatis brunnescentibus; foliis chartaceis vel tenuiter coriaceis minute pellucido-punctatis in sicco supra nitidis atro-olivaceis subtus leviter pallidioribus minute atro-glandulosi, oblongo-ellipticis, 18–20 cm. longis, 6.5–8.5 cm. latis, utrinque sensim angustatis basi cuneatis vel subobtusis apice abrupte acuminatis, acumine  $\pm$  1 cm. longo obtusiusculo, costa supra canaliculata subtus prominente, nervis primariis utrinsecus  $\pm$  15 oblique adscendentibus in venam intramarginalem 2–3 mm. a margine arcuatim confluentibus supra leviter insculptis subtus prominulis, reticulo laxo inconspicuo; petiolo  $\pm$  1.5 cm. longo; inflorescentiis e nodis defoliatis



ortis 10–20 cm. longis latisque, ramis valde divaricatis, rhachi ramis ramulisque subteretibus vel leviter compressis, bracteis parvis subpersistentibus; floribus basi bibracteatis sessilibus triadibus apice ramulorum, alabastris pyriformibus basi angustatis 4 mm. longis, 3 mm. diametro; calycis tubo 3 mm. longo latoque margine minute 4-lobato, sub lobis paullo constricto; staminibus circiter 5 mm. longis; fructibus non visis.

NETHERLANDS NEW GUINEA: Otakwa, *Neth. Ind. For. Service* bb.22092, January 1937. SOLOMON ISLANDS: Bougainville: Kieta, *Kajewski* 1544 (TYPE), March 1930, sea-level, common in rain-forest (large tree up to 30 m. high; calyx pink, stamens white, very showy).

This species is very much like the description of *Syzygium acutangulum* (K. Schum.) Niedenzu, except that the latter has very sharply 4-angled branchlets in both the vegetative and the reproductive parts of the plant.

***Syzygium torricellianum*** Diels, Bot. Jahrb. **57**: 405. 1922.

NETHERLANDS NEW GUINEA: 15 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh* 11934, January 1939, alt. 1740 m., occasional in primary forest (tree 32 m. high, 38 cm. diameter; bark reddish brown; flowers rose).

This collection fits the original description of *Syzygium torricellianum* Diels. Known previously only from the type-collection.

A. Bracts of the inflorescence various, mostly deciduous.

B. Inflorescence mostly reduced to solitary flowers (also cymose in *S. saliciforme*).

***Syzygium callianthum*** sp. nov.

Arbor parva usque 6 m. alta; ramis cinereo-fuscescentibus; ramulis tetragonis brunnescentibus; foliis tenuiter coriaceis vix pellucido-punctatis subtus conperse minuteque glandulosis inconspicue reticulatis supra olivaceis vel brunnescentibus subtus pallidioribus fulvo-brunnescentibus oblongis vel anguste ellipticis, 8–15 cm. longis, 2.5–6 cm. latis, basi cuneatis vel obtusis apice subabrupte acuminatis, acumine 1–1.5 cm. longo 2 mm. lato obtuso, margine leviter recurvatis, costa supra canaliculata subtus elevata, venis primariis utrinsecus 13–20 supra insculptis subtus perspicuis subtransversis in venam intramarginalem perspicuam 2 mm. a margine distantem confluentibus; petiolo 2–5 mm. longo atrofusco; pedunculo vix 4 mm. longo, pedicello 7–11 mm. longo; floribus magnis terminalibus solitariis creberrime minuteque glandulosis; calycis tubo toto obtuso obconico-turbinato, 2.5–3 mm. longo: basi 5–8 mm. lato, dein 0.7–1 cm. longo, gradatim ampliato 1–1.5 cm. lato, supra valde aucto  $\pm$  4 cm. lato, lobis 4 rotundatis exterioribus  $\pm$  1 cm. longis, interioribus  $\pm$  1.5 cm. longis; petalis 2.5 cm. longis 3 cm. latis, breviter unguiculatis; staminibus  $\pm$  3 cm. longis, antheris 2 mm. longis; disco stamineo 4–5 mm. lato; fructibus ignotis.

BRITISH NEW GUINEA: Central Division, Mt. Tafa, *Brass* 4146 (TYPE), May 1933, common small substage tree in foot-hill forest (sparsely foliated and slender, up to 6 m. tall; leaves yellowish beneath; very showy flowers about 8 cm. diameter when fully open; sepals outside green tipped with red, inside red; petals red; filaments pink, anthers whitish).

This is a well marked species with tetragonous branchlets, leaf-venation strongly impressed above and prominent beneath, and very showy flowers. The flowers are about the size of those of *Syzygium eximiflorum* (Diels)



comb. nov. (*Jambosa eximiflora* Diels, Nov. Guin. **14**: 92. 1924), but they are not stipitate at the base, the leaves are not emarginate at the base, and the acumen is only about half as long as in the related species. Amongst the Malaysian material, this species shows some resemblance to *Eugenia johorensis* Ridl., but there are differences in both the branchlet- and the leaf-characters.

**Syzygium Keysseri** (Schlechter) comb. nov.

*Jambosa Keysseri* Schlechter in Diels, Bot. Jahrb. **62**: 485. 1929.

NETHERLANDS NEW GUINEA: Bele River, 18 km. northeast of Lake Habbema, *Brass* 11392, November 1938, alt. 2200 m., occasional in secondary forest (tree 3–5 m. high; flowers red with green stamens).

The type was collected on Mt. Sarawaket at 3000 m. altitude. The material here cited differs from the original description only in the size of the leaves (3–6 cm. long, 1.5–3 cm. broad), the diameter of the calyx-tube, and the size of the petals. This is probably owing to the two plants being in different stages of development. We should like to add that some of the leaves are obtuse at the apex and all are shallowly cordate at the base. The flower, including the filaments and the connective of the anther sacs, is copiously glandular.

**Syzygium macrocalyx** sp. nov.

Arbor vel frutex; ramulis teretibus vel leviter compressis; foliis coriaceis obscure reticulatis in sicco supra atro-brunnescentibus minute punctulatis subtus pallidioribus. ellipticis interdum paullo obliquis, 8.5–16 cm. longis, 3.5–7 cm. latis, basi cuneatis apice verisimiliter acuminatis (apice summo fracto) margine leviter revolutis, costa supra canaliculata subtus elevata, nervis primariis utrinsecus 11–17 oblique patentibus in venam intramarginalem  $\pm$  3 mm. a margine distantem confluentibus supra manifestis subtus prominulis; petiolo  $\pm$  5 mm. longo; pedunculo 5 mm. longo cras-soque: flore singulo terminali post anthesim obconico-campanulato, calycis tubo 3.5 cm. longo (incl. partem supra ovarium vix 1 cm. productam) basi 1 cm. apice 2.5–2.7 cm. lato, crasse longitudinaliter rugoso, lobis 5–9 mm. longis  $\pm$  1 cm. latis, disco stamineo 3 mm. lato.

NORTHEASTERN NEW GUINEA: Morobe District, Sattelberg, *Clemens* 3078 (TYPE), April 1936, alt.  $\pm$  1000 m.

We are unable to suggest the alliance of this species. The flower approaches that of **Syzygium Grevesianum** nom. nov. (*Eugenia pterocalyx* Greves, Jour. Bot. **61**: Suppl. 17. 1923) but the calyx-tube is not winged, though coarsely rugose, and the leaves are shorter and broader. The specific name *pterocalyx* has already been used in *Syzygium*.

**Syzygium saliciforme** sp. nov.

Arbor 3–4 m. alta; ramulis tenuibus sulcatis; foliis  $\pm$  confertis impel-lucidis chartaceis utrinque opacis supra olivaceis subtus pallidioribus, lanceolatis, 6–14 cm. longis, 1–2 cm. latis, basi cuneatis vel acutis apice longe acuminatis, costa supra canaliculata subtus prominula, nervis primariis utrinsecus  $\pm$  16 subpatentibus in venam intramarginalem  $\pm$  2 mm. a margine confluentibus, reticulo obscuro; petiolo 2–5 mm. longo; cymis axillaribus 3–1-floris, 2.5–4 cm. longis, pedunculo 0.5–2 cm. longo; calycis tubo infero stipitato supero pyriformi 8 mm. longo includente

stipitem 3 mm. longum, lobis 4 circiter 1.5 mm. longis triangularibus obtusiusculis; petalis singillatim deciduis; staminibus  $\pm$  1 cm. longis; fructibus stipitato-subglobosis.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass* 7243 (TYPE), July 1936, alt. 100 m., restricted to inundation banks of river (tree 3–4 m. high, with layered drooping branches; flowers pink; fruit soft, white, up to 2.8 cm. diameter).

On account of the two collections, *Brass* 7243 and 7244, which we have at hand, we are inclined to believe that this, rather than *Syzygium salicinum* (Ridl.) Merr. & Perry, is the species represented by *Jambosa salicina* Diels. This closely fits Diels's description and he does not mention the calyx-lobes; these are small enough to be overlooked in this species, but surely not in the other. However, the name is already pre-empted by Ridley's earlier use. Since we have not access to the original material, we have described the species as new. The matter cannot be settled definitely without a comparison with authentic material. The species also seems to be somewhere in the neighborhood of *Syzygium Daphne* (Ridl.) comb. nov. (*Eugenia Daphne* Ridl. Trans. Linn. Soc. Bot. II. 9: 45. 1916), but the leaves are not rounded at the base, the apex is distinctly long acuminate, and the pedicels are erect.

***Syzygium salicinum*** (Ridl.) comb. nov.

*Eugenia salicina* Ridl. Trans. Linn. Soc. Bot. II. 9: 45. 1916.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass* 7244, July 1936, alt. 100 m., restricted to river inundation banks (tough low tree 2–3 m. high, with horizontal wide spreading branches; leaves very dark green; large solitary white flowers).

As nearly as we can judge from the photograph and the description of this species, *Brass* 7244 belongs here. Diels, Bot. Jahrb. 57: 390. 1922, described a *Jambosa salicina* which he later accepted as Ridley's species, Nov. Guin. 14: 91. 1924, the latter having been overlooked at the time of his earlier publication. We do not know whether he had seen the original of Ridley's species or not, but his description seems to us to suit better the material which we have described as *Syzygium saliciforme*. Since we are not sure of this without an opportunity to examine the original material, we are not placing *Jambosa salicina* Diels in our synonymy.

***Syzygium soliflorum*** (Diels) comb. nov.

*Jambosa soliflora* Diels, Bot. Jahrb. 57: 393. 1922.

NORTHEASTERN NEW GUINEA: Yunzaing, *Clemens* 2954, 6436, March 1936, June 1937, alt.  $\pm$  1350 m.

These collections fit Diels's description of this species very closely. In addition to the above we tentatively place here (noting differences) a collection from BRITISH NEW GUINEA: Mount Tafa, *Brass* 4910, August 1933, alt. 2400 m., valley forests (slender small tree with brown somewhat flaky bark and hard brown wood; dark smooth leaves pale beneath; solitary reddish flowers). The leaves are a little smaller, 2.5–6 cm. long, 1–2.5 cm. broad, the acumen is a little shorter and broader than in the collections from Northeastern New Guinea, in the dried specimens the lower surface

of the leaves is pale brownish rather than brownish green, and the primary veins are a little less conspicuous. There is scarcely any difference in the flowers except that *Brass 4910* is copiously reddish gland-dotted whereas the Clemens collections are profusely supplied with yellowish or brownish glands. This may be owing to a different mode of drying. Both have sharply 4-angled branchlets on the new growth and greyish bark on the older branchlets.

The leaves are too small to place the specimens in *Syzygium tricolor* (Diels) comb. nov. (*Jambosa tricolor* Diels Bot. Jahrb. **57**: 393. 1922). On the other hand it is to be noted that the flower in these collections represents a reduced cyme as indicated in the description of *Syzygium tricolor*, since it is supported on a jointed peduncle and pedicel; however, the peduncle in this particular collection is very short.

*Syzygium tympananthum* (Diels) comb. nov.

*Jambosa tympanantha* Diels, Bot. Jahrb. **57**: 393. 1922.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 12573*, February 1939, alt. 1300 m., rare in primary forest on slope of ridge (tree 23 m. high, 41 cm. diameter; bark red-brown; ripe fruit red); 4 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13159*, March 1939, alt. 800 m., common in secondary rain-forest on plain (tree 26 m. high, 42 cm. diameter; bark grey; fruit red). NORTHEASTERN NEW GUINEA: Yunzaing, *Clemens 3976*, 4077, August, September 1936, alt. 1350–1500 m.; Sattelberg, *Clemens 1071*, December 1935, alt. 1000–1200 m.

This species has a very distinctive fruit.

*Syzygium uniflorum* sp. nov.

Arbor parva 4–5 m. alta; ramis cinereis; ramulis brunnescentibus compressis; foliis tenuiter coriaceis novellis creberrime pellucido-punctatis supra olivaceis minute punctatis subtus pallidioribus creberrime minuteque glandulosis oblongis vel anguste lanceolatis, 4–8 cm. longis, 1–2.3 cm. latis, basi elongato-cuneatis apice caudato-rostratis, cauda  $\pm$  1.5 cm. longa obtusa, costa supra canaliculata subtus prominula, nervis numerosis tenuibus oblique patentibus supra subobscuris subtus manifestis vix prominulis; petiolo circiter 2 mm. longo; floribus axillaribus solitariis, pedunculo 3–6 mm. longo, pedicello  $\pm$  5 mm. longo; calycis tubo 7–10 mm. longo stipitato-turbinato crebre glanduloso hinc inde verruculoso, lobis 4 circiter 2 mm. longis 4 mm. latis exterioribus paullo minoribus; petalis singillatim caducis  $\pm$  4 mm. longis subrotundatis glandulosis; staminibus 5 mm. vel ultra longis, filamentis glandulosis, antheris oblongis 1 mm. longis; stylo  $\pm$  1.5 cm. longo; fructibus immaturis stipitato-subglobosis subverruculosis.

BRITISH NEW GUINEA: Central Division, Kubuna, *Brass 5608* (TYPE), December 1933, alt. 100 m., river bed gravel banks (small tree 4–5 m. tall; flowers white; immature fruits rugose).

In the small leaves and the solitary flowers *Syzygium uniflorum* suggests *Syzygium Pilgerianum* (Lauterb. & K. Schum.) comb. nov. (*Jambosa Pilgeriana* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzg. Südsee 473. 1900), but it differs from the latter in the compressed rather than quadrangular branchlets, the inconspicuous venation of the leaves, and the somewhat verruculose flowers and fruits.

***Syzygium vaccinioides* sp. nov.**

Arbor parva vel frutex; ramis  $\pm$  cinereis cortice desquamato; ramulis crebris brunnescentibus conspicue crispuleque 4-alatis saepe crebre glandulosis; foliis chartaceis pellucido-punctatis supra olivaceis subtus pallidioribus glanduloso-pustulatis ellipticis vel obovatis, 5–8 mm. longis, 3–5 mm. latis (semper quam latis longioribus), basi cuneatis apice obtusis, costa supra inconspicua subtus vix prominula, nervis primariis vix manifestis; petiolo 1 mm. longo; floribus solitariis axillaribus nitidis basi bibracteatis, bracteis circiter 3 mm. longis oblongis basi angustatis foliiformibus, pedunculo  $\pm$  2.5 mm. longo alato; calycis tubo circiter 2.5 mm. longo obconico-campanulato supra dilatatum subquadrangularem, lobis 4 circiter 1 mm. longis rotundatis; petalis vix 1 mm. longis singillatim caducis; staminibus 9–11, filamentis  $\pm$  0.5 mm. longis, antheris 0.4 mm. longis subrotundatis; fructibus usque 6 mm. diametro.

BRITISH NEW GUINEA: Central Division, Wharton Range, Murray Pass, *Brass* 4515 (TYPE), July 1933, alt. 2840 m., forest borders (densely foliaged small tree or bush of erect branching habit; aromatic; leaves concave, shining, paler and punctate beneath; solitary greenish white flowers; fleshy red fruit up to 6 mm. diameter).

This plant is very closely related to *Syzygium alatum* (Lauterb.) Diels. It differs in the elliptic or obovate leaves (always longer than broad), the crisped wings of the branchlets, and the slightly larger flower with obtuse calyx-lobes. The two fruits available for examination do not have seeds, but, as far as we can see at present, there is no reason not to accept the species as *Syzygium*.

***Syzygium Versteegii* (Lauterb.) comb. nov.**

*Jambosa Versteegii* Lauterb. Nov. Guin. **8**: 321. 1910, l. c. 850. 1912; Diels, Bot. Jahrb. **57**: 391. 1922, Jour. Arnold Arb. **10**: 83. 1929; White, l. c. 252.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh* 12562, February 1939, alt. 1200 m., occasional in primary forest (tree  $\pm$  20 m. high, 40 cm. diameter; bark gray, scaly; fruit red). BRITISH NEW GUINEA: Lake Daviumbu, Middle Fly River, *Brass* 7694, rain-forest substage tree growing close to water (10 m. high; leaves pale beneath; flowers large, glaring pink; fruit roughly oblong,  $\pm$  9  $\times$  6 cm., found rotting on the ground); Lower Fly River, east bank opposite Sturt Island, *Brass* 8019, October 1936, rain-forest substage tree, occasional on flood-plains and low ridges (6–8 m. high, flowers pink).

In *Brass & Versteegh* 12562 the primary veins are a little closer together than in the other numbers and possibly the petioles are slightly longer, but it seems to belong to this species.

*B. Inflorescence various, flowers few or many, usually not solitary.*

*C. Flowers large, calyx-tube 8 mm. or more in diameter immediately below the calyx-lobes.*

*D. Inflorescence usually below the leaves at defoliated nodes or on the trunk.*

***Syzygium gonatanthum* (Diels) comb. nov.**

*Jambosa gonatantha* Diels, Bot. Jahrb. **57**: 384. 1922.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass & Versteegh* 14106, May 1939, alt. 75 m., in primary rain-forest on lower mountain slopes (tree 21 m. high, 43 cm. diameter; bark dark brown, scaly; flowers red).

As far as we can judge from Diels's very sketchy description, this collec-



tion may belong here. The leaves are a little smaller ( $6.5-17 \times 2-6$  cm.) than in the type, the primary nerves are arcuate, barely, if at all, forming an intramarginal vein, and the petioles 1.5 cm. long. The secondary venation is obscure. The fully mature flowers are red rather than white; calyx-tube 1.2-1.5 cm. long, turbinate-obconic, about 1 cm. wide at the apex, at the base 2-2.5 mm.; inner calyx-lobes 5 mm. long, 7 mm. broad, petals  $\pm 1$  cm. long; stamens about 2 cm. long.

***Syzygium heterobotrys* sp. nov.**

Arbor 12 m. alta; ramulis teretibus brunnescentibus; foliis chartaceis impellucidis, in sicco supra atro-brunnescentibus subtus pallidioribus inconspicue reticulatis, ellipticis vel oblongo-ellipticis vel leviter obovato-ellipticis, 14-27 cm. longis, 4-10 cm. latis, interdum leviter obliquis utrinque fere aequaliter angustatis basi cuneatis apice breviter acuminatis, acumine  $\pm 1$  cm. longo basi  $\pm 7$  mm. lato obtusiusculo, costa supra canaliculata subtus elevata, nervis primariis utrinsecus 9-13 oblique adscendentibus 7-10 mm. a margine elongato-subarcuatis confluentibus supra manifestis subtus prominulis, vena submarginali secundaria  $\pm 4$  mm. a margine disposita; petiolo 1.5-2 cm. longo bicolore parte inferiore atrofusco crassiusculo subtereti, superiore pallidiore canaliculato; inflorescentiis caulifloris vel etiam in ramulis foliatis terminaliter dispositis, usque 13 cm. longis; pedunculo 2-8 cm. longo; floribus sessilibus in apice ramorum brevium ( $\pm 1.5$  cm. longorum) vel plerumque in nodis 2-3 dispositis 5-7-verticillatis vel subverticillatis, nodis inter se 0.5-2.5 cm. remotis; calycis tubo basi 4-7 mm. stipitato sursum  $\pm 1.2$  cm. turbinato minute puberulo striato-ruguloso, lobis 4 circiter 3 mm. longis rotundatis; petalis 4 singillatim caducis; staminibus 1.5-2 cm. longis; fructibus ignotis.

BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 8238 (TYPE), November 1936, rain-forest substage (profusely flowering cauliflorous tree 12 m. high; flowers also terminal on leafy branchlets; petals green; stamens yellow).

A very distinct species for which we cannot suggest any apparently close relative. The sparsely (if at all) branched inflorescences with the flowers in verticillate or subverticillate whorls at two or three nodes (terminal and below), the long-stipitate turbinate puberulent flowers, and the rather distinct primary veins, which are elongate-arcuate and confluent, forming an irregular intramarginal vein well within the margin of the leaf, are characters which make this species easily recognized.

***Syzygium laqueatum* sp. nov.**

Arbor 20 m. alta; ramis cortice cinereis; ramulis compressis vel obtuse subangulatis brunnescentibus; foliis impellucidis in sicco olivaceis utrinque manifeste reticulatis, ellipticis, 10-18 cm. longis, 5-10 cm. latis, basi subrotundatis apice (totis laesis) obtusiusculis (?), margine anguste recurvatis, costa supra plana vel basim versus leviter canaliculata subtus prominente, nervis primariis 6-9 patenti-adscendentibus marginem versus crebre anastomosantibus supra leviter elevatis subtus prominulis; petiolo 1.5 cm. longo; inflorescentiis e nodis defoliatis ortis, 4-9 cm. longis a basi ramosis, ramulis subangulatis; floribus pedicellatis vel sessilibus apice ramulorum articulorum; calycis tubo elongato-obconico vel -turbinato, basi stipitato 1.3-1.5 cm. longo, lobis 4 late rotundatis exterioribus 3 mm. interioribus 5

mm. longis; petalis rotundatis 1 cm. longis; staminibus 1.5 cm. longis; fructibus immaturis.

NETHERLANDS NEW GUINEA: 18 km. northeast of Lake Habbema, *Brass & Versteegh 11157* (TYPE), November 1938, alt. 2350 m., rare in primary forest (tree 20 m. high, 43 cm. diameter; bark brown, scaly; flowers white; young fruit soft green).

This species shows some resemblance to *Syzygium pachycladum* (Lauterb. & K. Schum.) comb. nov. (*Jambosa pachyclada* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 474. 1900), but it has smaller leaves with conspicuous venation; there is no definite intramarginal vein, but the primaries are variously connected by anastomoses in a region just within the margin. The bracts of the inflorescence have already fallen.

The following two fruiting collections appear to be closely allied; we are not sure that they are conspecific: NETHERLANDS NEW GUINEA: 2 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13508*, March 1939, alt. 700 m., occasional on slopes of primary forest (tree 37 m. high, 86 cm. diameter; bark brown, scaly; fruit below the leaves, pyriform, 5 cm. long, 3 cm. diameter); 6 km. southwest of Bernhard Camp, Idenburg River, *Brass & Versteegh 13106*, March 1939, alt. 1170 m., occasional in primary forest (tree 31 m. high, 48 cm. diameter; bark grey, scaly; fruit on old growth, obliquely pyriform, dark red, 4 cm. long, 3.5 cm. diameter). In this complex also belongs *Brass & Versteegh 11956*, a sterile collection.

*Syzygium Leonhardi* (Diels) comb. nov.

*Jambosa Leonhardi* Diels, Bot. Jahrb. **57**: 384. 1922.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass 7323*, July 1936, alt. 100 m., peculiar to flood-plain forest (tree attaining 10 m.; foliage damaged by leaf-cutting insects; leaf-nerves impressed above, prominent below; fruit scattered along the stem, solitary, almost sessile, turgid, red, to  $\pm 7$  cm. diameter).

This collection has too many characters in common with the brief original description of the species to place it elsewhere without an actual examination of the type. It is to be noted, however, that the secondary venation of the leaves is manifest though not at all conspicuous.

*Syzygium thalassicum* sp. nov.

Arbor parva vel frutex altus; ramulis acute tetragonis anguste alatis rubro-brunnescentibus; foliis sessilibus coriaceis in sicco supra brunnescentibus subtus fulvo-brunnescentibus minute glandulosis inconspicue reticulatis oblongo-lanceolatis, 19–21.5 cm. longis, 7.5–8.5 cm. latis, basi cordatis apice obtuse acutis margine leviter recurvatis, costa supra impressa subtus elevata, nervis primariis utrinsecus  $\pm 13$  late patentibus in venam intramarginalem crenatam  $\pm 5$  mm. a margine distantem confluentibus, vena submarginali secundaria cum primaria subparallela 1–2 mm. a margine disposita; inflorescentiis completis non visis; floribus post anthesim pyriformibus minute glandulosis; calycis tubo circiter 2 cm. longo (incl. supra ovarium 4–5 mm. producto), apice 1 cm. lato; lobis 4 rotundatis, exterioribus  $\pm 2$  mm. longis, interioribus 5 mm. longis, 7 mm. latis; staminibus fractis; fructibus 3.5–4 cm. longis,  $\pm 1.7$  cm. diametro, minute glandulosis subleviter longitudinaliter rugosis pyriformibus vel

ellipticis basi stipitatis, stipite 6-7 mm. longo, apice calycis lobis conniventibus coronatis.

SOLOMON ISLANDS: Ulawa, *Brass* 2971 (TYPE), October 1932, common on ocean foreshores (small tree or tall shrub with a few stiffly spreading branches; peduncle and pedicels red; calyx-tube cream-colored, lobes pale pink; petals and stamens white; fruit red, rugose).

This species suggests *Syzygium goniopterum* (Diels) comb. nov. (*Jambosa gonioptera* Diels Bot. Jahrb. **57**: 391. 1922), and *Eugenia stelechanthoides* Kaneh. It appears to be distinct from both by the obtusely acute leaves and the larger pyriform flowers; the fruits too are not like those of the second species.

***Syzygium pyriforme* sp. nov.**

Arbor 6-10 m. alta; ramulis tenuibus 4-angulatis brunnescentibus; foliis impellucidis chartaceis vel tenuiter coriaceis, lineari-lanceolatis, 5.5-12 cm. longis, 1-2.7 cm. latis, basi rotundato-cuneatis vel cuneatis apice tenuiter acuminatis vel subcaudatis, acumine 1-2 cm. longo basi 3 mm. lato interdum leviter curvato, costa supra canaliculata subtus prominente, nervis primariis utrinsecus 10-12 supra insculptis subtus prominulis in venam intramarginalem 2-3 mm. a margine confluentibus, reticulo obscuro; petiolo 3-5 mm. longo atrofusco; floribus e trunco ortis fasciculatis; pedunculo brevissimo 1-2 mm. longo; pedicello 4-7 mm. longo tetragono; alabastris 1.5 cm. longis, turbinatis stipitatis, calycis tubo 14 mm. longo incl. stipite 2-4 mm. longo, obscure puberulo, lobis 4 brevibus  $\pm$  2.5 mm. longis, 4 mm. latis in anthesi = fractis; petalis subrotundatis  $\pm$  7 mm. longis; staminibus  $\pm$  2 cm. longis, antheris anguste oblongis 2 mm. longis; fructibus ignotis.

BRITISH NEW GUINEA: Palmer River, 2 miles below Black River Junction, *Brass* 6966 (TYPE), June 1936, alt. 100 m., common in flooded riverine forest (small richly branched tree 6-10 m. high, with numerous small fascicles of showy flowers lateral on lower stem below the branches; calyx rose pink; petals green; stamens yellow).

In description this plant approaches *Syzygium Dielsianum* nom. nov. (*Jambosa pycnantha* Diels Bot. Jahrb. **57**: 394. 1922). In the latter, a plant of higher altitude, the leaves are broader, and the flowers are a little smaller, differing in both shape and color from those here described. The specific name *pycnanthum* is pre-empted in *Syzygium*.

*Syzygium samarangense* (Blume) Merr. & Perry, Jour. Arnold Arb. **19**: 115, 216. 1938, Mem. Am. Acad. Sci. **18**(3): 167 (Mem. Gray Herb. **4**: 167). 1939.

*Myrtus samarangensis* Blume Bijdr. 1084. 1826.

*Eugenia javanica* Lam. Encycl. **3**: 200. 1789; Engler, Bot. Jahrb. **7**: 468. 1886; Lane-Poole, Rep. For. Res. Papua 125. 1925, non *Syzygium javanicum* Miq.

*Jambosa javanica* K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 470. 1900; Reehinger, Denkschr. Mat.-Nat. Kl. Akad. Wiss. Wien **89**: 585 (Bot. Zool. Ergeb. Wiss. Forsch. Samoa-I. Neug.-Arch. Salomonsins. **5**: 143). 1913; Diels, Bot. Jahrb. **57**: 387. 1922.

SOLOMON ISLANDS: San Cristobal: Huru River, *Brass* 3006, October 1932, rare on river bank (large spreading tree with blotched brown bark peeling in large thin flakes; hard brown wood; leaves thin, shining; petioles red; flowers white); Y s a b e l: Meringe, *Brass* 3182, November 1932, alt. 20 m., limestone hills (tree 25 m. tall; hard brown wood; brown wrinkled bark exfoliating in thin flakes; fruit red, about 3.5 cm. diameter).

Possibly also belonging to this species in its wider sense, or closely re-

lated, is a collection from BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 8102, October 1936, rain-forest, lesser canopy tree of flood plains (stem spurred at base; bark thick, pale brown; flowers waxy cream-colored, very numerous on old wood). The leaves of this collection are something like those of *Syzygium ovalifolium* (Blume) comb. nov. (*Jambosa ovalifolia* Bl. Mus. Bot. Lugd.-Bat. 1: 98. 1849), but the inflorescence does not correspond to the description of that species.

*Syzygium vernicosum* sp. nov.

Arbor magna; ramulis brunnescentibus in sicco cortice longitudinaliter rugulosis  $\pm$  sulcatis; foliis in sicco olivaceis vel flavo-viridescentibus supra vernicosis subtus opacis impellucidis valde coriaceis laxè inconspicueque reticulatis, ellipticis vel oblongis, 15–20 cm. longis, 5–8.5 cm. latis, basi rotundatis vel rotundato-cuneatis apice abrupte obtuse acuminatis margine anguste revolutis, costa supra canaliculata subtus prominente, longitudinaliter rugulosa, nervis primariis utrinsecus 8–12 utrinque perspicuis oblique adscendentibus inter se  $\pm$  1.5 cm. remotis marginem versus arcuatim confluentibus interdum venam intramarginalem formantibus vel 2–3 infimis liberis sursum evanescentibus, secundariis fere aequaliter prominulis; petiolo  $\pm$  2 cm. longo, 3–4 mm. crasso atrofusco ruguloso in dimidio superiore supra inconspicue canaliculato; inflorescentiis e nodis defoliatis ortis, rhachi usque 2.5 cm. longa  $\pm$  5 mm. diametro,  $\pm$  4-angulata; floribus subracemosis vel interdum subumbellatis, magnis; alabastris tantum visis,  $\pm$  2.8 cm. longis; calycis tubo parte inferiore striato-ruguloso subcylindrico  $\pm$  1 cm. longo 4–5 mm. crasso, superiore campanulato 0.8 cm. longo vix infra lobis leviter constricto, circiter 1.2 cm. diametro, lobis rotundatis exterioribus 0.5 cm. longis, 1 cm. latis, interioribus 1 cm. longis.

BRITISH NEW GUINEA: Lower Fly River, east bank opposite Sturt Island, *Brass* 8113 (TYPE), October 1936, rain-forest, occasional on the ridges (large spur-buttressed canopy tree; bark pale brown, thick, shedding in soft scales; leaves stiff, yellow beneath; flowers pink, very numerous on the smaller branches; peduncles 4-angled).

Among the species described from Papua, the collection is perhaps related to *Syzygium Leonhardi* (Diels) Merr. & Perry. However, in our species, the upper surface of the leaves shines almost as if varnished, the primary veins are almost equally prominent on both surfaces, the inflorescence has a definite axis on which the flower-buds are subsessile, there being a very short or thin base articulated between them and the axis.

*Syzygium virescens* sp. nov.

Arbor parva 5–6 m. alta; ramulis compressis atrofuscis; foliis coriaceis supra brunnescentibus subtus pallidioribus inconspicue laxè reticulatis minute atro-glandulosis, lanceolatis, 20–30 cm. longis, 6–8 cm. latis, basi cuneatis apice? (fractis), margine vix recurvatis, costa supra canaliculata subtus elevata, nervis primariis utrinsecus 7–10 regularibus cum vena intramarginali 5 mm. a margine distante supra insculptis subtus elevatis; petiolo circiter 1 cm. longo basi crassiusculo; inflorescentiis e trunco infero ortis,  $\pm$  4 cm. longis, a basi pauciramosis vel subfasciculatis; floribus sessilibus, calycis tubo  $\pm$  1 cm. longo basi 3 mm. stipitato supra 7 mm. obconico in sicco leviter striato-ruguloso, lobis 4 rotundatis, exterioribus 1.5 mm. longis, interioribus 3 mm. longis; petalis rotundatis  $\pm$  7 mm. longis singillatim deciduis; staminibus 2 cm. longis; fructibus ignotis.



NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass 13950* (TYPE), April 1939, alt. 50 m., frequent in rather swampy forest on river-plains (undergrowth tree 5-6 m. high; flowers greenish white, clustered on lower stem).

This species seems to be most like *Syzygium gonatanthum* (Diels) Merr. & Perry, but the leaves are very distinctly coriaceous, narrower than in Diels's species, and the nerves are conspicuously impressed on the upper surface.

*D. Inflorescence terminal and axillary (also lateral in S. heterobotrys).*

***Syzygium brevicymum*** (Diels) comb. nov.

*Jambosa brevicyma* Diels, Bot. Jahrb. **57**: 389; 1922.

NETHERLANDS NEW GUINEA: 4 km. southwest of Bernhard Camp, Idenburg River, *Brass 13223*, March 1939, alt. 850 m., rain-forest, plentiful on river banks (low flat-branching flood-resistant tree 3-5 m. high; flowers white).

This collection appears to be relatively close to the description of this species. Leaves somewhat coriaceous, 11-16 cm. long, 3-4.5 cm. broad, with petiole 5 mm. long; inflorescence 3-4 cm. long; calyx-tube  $\pm$  1 cm. long, 7 mm. broad at the apex. Without access to the type, we think the collection is better placed here than elsewhere at present.

***Syzygium evenulosum*** sp. nov.

Arbor  $\pm$  19 m. alta, 41 cm. diametro; ramulis teretibus vel vix obtuse angulatis brunnescentibus; foliis coriaceis in sicco supra olivaceis vel atrobrunnescentibus obscure reticulatis subtus fulvo-brunnescentibus haud reticulatis consperse pellucido-punctatis vel impellucidis, ellipticis vel late oblongis, 11-21 cm. longis, 4.5-9 cm. latis, basi breviter cuneatis apice leviter recurvato breviter abrupte acuminatis margine leviter recurvatis, costa supra canaliculata subtus prominente, nervis primariis utrinsecus 12-15 utrinque manifestis inconspicuis patenti-adscendentibus 7-10 mm. a margine arcuatim conjunctis, supra interdum vena submarginali secundaria vix manifesta; petiolo 1-1.5 cm. longo atrofusco; inflorescentiis axillaribus terminalibusque interdum e nodis defoliatis ortis, 3-4 cm. longis parce ramosis, alabastris sessilibus glandulosis; calycis tubo obconico vel obpyramidato basi 3 mm. apice sub lobis 10-12 mm. diametro, lobis late rotundatis, interioribus  $\pm$  6 mm. exterioribus  $\pm$  4 mm. longis; petalis subrotundatis 8-10 mm. longis, breviter unguiculatis, margine crispule undulatis; staminibus  $\pm$  1.5 cm. longis, antheris oblongis 1 mm. longis; fructibus non visis.

NETHERLANDS NEW GUINEA: Bernhard Camp, Idenburg River, *Brass & Versteegh 14108* (TYPE), May 1939, alt. 80 m., primary rain-forest of lower mountain slopes (tree 19 m. high, 41 cm. diameter; bark brown, scaly; flowers white).

This species appears to be a close ally of *Syzygium nutans* (K. Schum.) Merr. & Perry. It may be distinguished from the latter by the coriaceous leaves with inconspicuous venation, the sparsely branched inflorescence, and the smaller white flowers.

***Syzygium Forbesii*** (Greves) comb. nov.

*Eugenia Forbesii* Greves, Jour. Bot. **61**: Suppl. 16. 1923.

The following specimens are very close to the description of this species: BRITISH NEW GUINEA: Bisiatabu, *Brass 600*; Borabere, *Brass 737*.

**Syzygium goniocalyx** (Lauterb.) comb. nov.

*Jambosa goniocalyx* Lauterb. Nov. Guin. **8**: 851. 1912; Diels, Bot. Jahrb. **57**: 390. 1922; White, Jour. Arnold Arb. **10**: 251. 1922.

BRITISH NEW GUINEA: Sturt Island, Lower Fly River, *Brass* 8137, October 1936, flood plain rain-forest (river bank tree 10 m. high; bark reddish, flaky; leaves citronella-scented; flowers greenish white); Wame River, Purari Delta, *Brass* 1079, February 1926, rain-forests (tree  $\pm$  9 m. high, with bright brown flaky bark; inflorescence lateral or leaf-opposed; fruit solitary or two together on a peduncle 2.5 cm. long).

In addition, we have *Brass* 657 named by Diels. Although flowering material forms the main part of the collection of *Brass* 8137, there is in it an immature globose-turbinate 9 mm. stipitate fruit about 2 cm. in diameter, which is valid proof that *Brass* 1079, an earlier unnamed fruiting specimen with fruit about 3 cm. diameter also belongs here. The fruit is 8-costate, with the costae thickish and obtuse rather than acute as in the flower; it has a single large seed about 2 cm. in diameter.

**Syzygium jambosoides** (Lauterb.) comb. nov.

*Careya jambosoides* Lauterb. Nov. Guin. **8**: 313. 1910; Knuth, Pflanzenr. **105**(IV. 219): 73. 1939.

*Eugenia jambosoides* O. Schwarz, Rep. Spec. Nov. **24**: 90. 1927.

BRITISH NEW GUINEA: Gaima, Lower Fly River (east bank), *Brass* 8301, November 1936, rare in open savannah-forest (compact xerophytic tree 8 m. high; bark thick, rough, fibrous scaly; leaves greyish beneath, nerves more prominent above; petioles red; flowers white, showy; fruit red).

This collection seems to agree very well with Lauterbach's description and Schwarz's discussion of this species except in the last phrase, "seminibus permultis ellipsoideis in pulpa carnosia nidulantibus." Whether Lauterbach had a fruit from some other collection we do not know, and Schwarz does not discuss this character at all. In the summary before his discussion of the New Guinean type, however, he points out that the species is distinguished by the leaf-form and venation, the compact small but richly flowered cymes with medium-sized flowers, and the 2-seeded fruits. The fruit may also be 1-seeded, but this is a variation well within the limits of the genus.

**Syzygium lagerstroemioides** sp. nov.

Arbor magna; ramulis vetustioribus subcinereis novellis brunnescentibus compressis sulcatis; foliis chartaceis minute subobscure pellucido-punctatis inconspicue reticulatis supra olivaceis subtus pallidioribus consperse minute atro-glandulosis, anguste obovatis vel ellipticis, 13-17 cm. longis, 5-6 cm. latis, basi cuneatis apice (saepissime fractis) acuminatis(?), costa supra canaliculata subtus elevata, nervis primariis utrinsecus 18-20 oblique patentibus supra leviter insculptis subtus prominulis in venam intramarginalem 2-3 mm. a margine confluentibus; petiolo 2-4 mm. longo; inflorescentiis terminalibus vel axillaribus, ramosis, circiter 15 cm. longis; floribus non visis; fructibus in sicco  $\pm$  3.5 cm. longis (incl. 1 cm. stipitatis), parte superiore globosa calycis lobis coronata,  $\pm$  2 cm. diametro, crebre verruculosa valde multicostata ( $\pm$  20), calycis lobis 4 minute glandulosis haud verruculosis vel costatis, majoribus in sicco 6 mm. longis, 1 cm. latis.

BRITISH NEW GUINEA: Eastern Division, Kurandi, *Brass* 1393 (TYPE), May 1926, river banks (large tree with bright pale brown papery bark; inflorescence axillary and terminal; fruit green, rugose, prominently ribbed).

The leaves and the branchlets of this species as well as the branching of the inflorescence strongly suggest *Syzygium goniocalyx* (Lauterb.) Merr. & Perry, but in the latter the flower is more or less strongly 8-ribbed or angled and not at all tuberculate. The fruit of *Brass 1393* has many more ribs and is covered with small excrescences which must surely in some degree appear on the flower.

*Syzygium nutans* (K. Schum.) comb. nov.

*Eugenia nutans* K. Schum. in K. Schum. & Hollr. Fl. Kaiser Wilhelms Land 90. 1889.

*Jambosa nutans* (K. Schum.) Niedenzu in Engl. & Prantl, Nat. Pflanzenfam. **3**(7): 84. 1893; K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 470. 1900; Diels, Bot. Jahrb. **57**: 395. 1922, Nov. Guin. **14**: 92. 1924; C. T. White, Jour. Arnold Arb. **10**: 251. 1929.

SOLOMON ISLANDS: Bougainville: Karngu, Buin, *Kajewski 2248*, October 1930, sea-level, common in rain-forest (medium sized tree up to 18 m. high; flowers with large green calyx, white petals and masses of cream-colored stamens); Guadalcanal: Berande, *Kajewski 2400*, January 1931, common in rain-forest (small tree 7 m. high; flowers with green calyx, cream petals and white stamens; fruit shiny pink when ripe, 11 cm. long, 9 cm. diameter,  $\pm$  lime-shaped); San Cristobal: Waimamura, *Brass 2649*, August 1932, coast, not common, on bank of a small stream in the rain-forest (loosely branched shrub 2 m. tall; leaves dull green, pale below; fruit solitary, terminal, reddish pink, up to 10 cm. long, 6 cm. diameter, very buoyant).

We have compared these specimens with Schumann's original description, Diels' elaborated one, and flowers of *Brass 1414*, identified by Diels. The only differences we find are in the color of the flowers and the size of the fruits. With no material available for comparison we cannot say whether these differences are specific or not, but we are inclined not to think so at present.

*Syzygium pteropodum* (Lauterb. & K. Schum.) comb. nov.

*Jambosa pteropoda* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 473. 1900; Lauterb. Nov. Guin. **8**: 850. 1912; Diels, Bot. Jahrb. **57**: 392. 1922.

NETHERLANDS NEW GUINEA: Albatros Bivak, v. *Leeuwen 9660*, July 1926, alt. 50 m. NORTHEASTERN NEW GUINEA: Yunzaing, *Clemens 3620, 3759*, July 1936, alt.  $\pm$  1500 m.

*Syzygium puberulum* sp. nov.

Arbor parva; ramis cinerascens; ramulis compressis brunnescentibus; foliis chartaceis consperse pellucido-punctatis vel semi-impellucidis, lineari-oblongis vel oblongis, 11-16 cm. longis, 2-3.5 cm. latis, basi obtuse cuneatis apice acuminatis, margine in sicco leviter undulatis, costa supra canaliculata subtus elevata, nervis primariis utrinsecus 18-22 oblique ascendens in venam intramarginalem vix 2 mm. a margine confluentibus utrinque manifestis non prominulis; foliis minutis apice ramulorum lanceolatis 5-7 mm. longis; petiolo 3 mm. longo atrofusco; inflorescentia terminali in ramulo axillari brevi circiter 12 cm. longa racemosa, apice congeste 5-flora, 2 floribus lateralibus ad nodum tumidum in pedicello 1 mm. longo; floribus in anthesi non visis; fructibus immaturis, calycis tubo turbinate-obconico vel obconico,  $\pm$  18 mm. longo incl. stipite 2-3 mm., apice 12-14 mm. diametro, extus brevissime velutino, lobis 4,  $\pm$  fractis, disco stamineo circiter 1.5 mm. lato.

BRITISH NEW GUINEA: Port Moresby, *Brass 838* (TYPE), December 1925, gully rain-forests (small tree about 4.5 m. tall; branches horizontal; smooth greenish bark exfoliating in thick flakes; fruit dull green, immature).



This collection differs from the description of *Syzygium megalospermum* (Lauterb. & K. Schum.) comb. nov. (*Jambosa megalosperma* Lauterb. & K. Schum. in K. Schum. & Lauterb. Fl. Deutsch. Schutzgeb. Südsee 472. 1900) in the much longer inflorescence and in the indument on the young fruit. The minute leaves at the apex of the branchlets suggest perhaps some relationship to that group of species which have very small bract-like leaves in pairs at the apex of the branches and between the pairs of leaves of regular size. If this be true, then the species here described is probably allied to *Syzygium argyrocalyx* (Warb.) comb. nov. (*Eugenia argyrocalyx* Warb. Bot. Jahrb. **13**: 390. 1891).

*Syzygium Randianum* sp. nov.

Arbor 30 m. alta; ramulis ultimis compressis cinereo-brunneis 2–3 mm. diametro; foliis tenuiter coriaceis in sicco olivaceo-viridibus copiose pellucido-punctatis supra nitidis subtus opacis utrinque crebre manifeste reticulatis, ellipticis vel obovato-ellipticis, 12–17 cm. longis, 4.5–8 cm. latis, basi rotundato-cuneatis, apice acuminatis ac paullo recurvatis, costa supra canaliculata subtus prominula, nervis primariis utrinsecus 12–16 oblique adscendentibus prope marginem  $\pm$  arcuatim confluentibus interdum venam intramarginalem formantibus infimis 2–3 longe adscendentibus; petiolo  $\pm$  1 cm. longo supra canaliculato brunnescente; inflorescentiis apice ramulorum foliiferorum quam caeteris crassiorum ( $\pm$  7 mm. diametro) sessilibus paucifloris; floribus magnis basi bibracteatis, bracteis ovatis 4 mm. longis obtusis rigidis; calycis tubo cylindrico vel subquadrangulari 1.7–2 cm. longo 8–9 mm. diametro, lobis 4 valde concavis interdum paullo compressis rotundatis crebre glandulosis exterioribus 1 cm. longis interioribus 1.5 cm. longis; petalis crebre glandulosis circiter 2 cm. longis rotundatis margine tenuibus undulatis; staminibus  $\pm$  3 cm. longis, antheris 1.5 mm. longis; fructibus ignotis.

BRITISH NEW GUINEA: Fly River, 528 mile Camp, *Brass 6673* (TYPE), May 1936, alt. 80 m., flood banks of a small creek (canopy tree 30 m. tall; stem flange-buttressed; bark pale reddish brown, 2 cm. thick, peeling in very small thin flakes; leaves smooth and shining; large cream-white flowers  $\pm$  7 cm. long crowded at ends of short thickened branchlets).

In the collection being worked over there are two species which appear to have the inflorescence terminal on short thickened branchlets: *Syzygium dictyophlebium* and *S. Randianum*. In the first is a branching inflorescence; the second consists of a compact cluster of 9–10 large sessile flowers each subtended by two rather rigid spreading bracts. In two of the flowers abnormalities occur; in one, one of the pair of bracts has grown up with the calyx-tube, while in the other, both bracts are at the base of the calyx-lobes; the normal position, as in other species, is at the base of the calyx-tube.

This species, by its short inflorescence and the elongate cylindric or subquadrangular ovary, suggests *Syzygium caryophylloides* (Lauterb.) comb. nov. (*Jambosa caryophylloides* Lauterb. Bot. Jahrb. **45**: 363. 1911) from the Bismarck Archipelago, but the latter has very much smaller flowers. Dedicated to Dr. A. L. Rand, the ornithologist of the Expedition.



***Syzygium spectabile* sp. nov.**

Arbor 4 m. alta; ramulis subcompressis atrocinereis; foliis (uno tantum viso) chartaceis glabris utrinque laxissime reticulatis elongato-ovatis, 57 cm. longis, 27 cm. latis, basi rotundatis apice ? (apice summo fracto), costa subtus conspicua, nervis primariis utrinsecus 18 tenuibus supra manifestis subtus prominulis oblique patentibus in venam intramarginalem arcuatim prominulam  $\pm 1$  cm. a margine distantem confluentibus, vena intramarginali secundaria cum primaria subparallela inconspicua 2-4 mm. a margine disposita; petiolo 3.5 cm. longo circiter 8 mm. crasso supra plano subtus rotundato rugoso; floribus in panicula cymosa pauciflora (in specimine typico 4-floris), axi 2.5 cm. longo, ramis circiter 1 cm. longis; floribus sessilibus apice ramorum solitariis; calycis tubo  $\pm 3$  cm. longo infero breviter stipitiformi 6-7 mm. longo, medio subconico circiter 1.2 cm. longo latoque, supero ad  $\pm 3$  cm. lato ampliato, lobis 4 rotundatis minoribus 7 mm. longis majoribus 1.3 cm. longis 2 cm. latis; petalis ovatis 3.5 cm. longis basi unguiculatis, unguicula 6-7 mm. lata; staminibus numerosis  $\pm 4$  cm. longis, filamentis exterioribus in dimidio inferiore coalitis, interioribus discretis vel 2-3 coalitis, antheris exterioribus anguste oblongis 2.5 mm. longis, interioribus minoribus; fructibus non visis.

NETHERLANDS NEW GUINEA: 6 km. southwest of Bernhard Camp, Idenburg River, *Brass 12995* (TYPE), February 1939, alt. 1200 m., rain-forest undergrowth (one example: tree 4 m. high; calyx red; petals reddish pink; stamens greenish white).

The collection consists of the tip of a branch with one leaf, the upper part of another, and a terminal inflorescence with a cyme at the apex and one lower branch, the opposite one being either broken off or undeveloped. Possibly this species is allied to *Syzygium nutans* (K. Schum.) Merr. & Perry, but it differs in the shape of the leaves and in having the outer filaments grown together in the lower half of their length. This coalition of the filaments is of various lengths, but the mass of stamens may be removed in a ring with the filaments unevenly loose in the upper part; the inner stamens are separated or sometimes united in twos or threes. The value or stability of this character we have been unable to determine.

(*To be concluded*)

